DANA SPICER®
Off-Highway Products

Service Manual

Industrial Planetary Axles - Heavy
Planetary Rigid
48T300

ASM-0117
August 2008

NOTES

FOREWORD

This manual has been prepared to provide the customer and maintenance personnel with information and instructions on the maintenance and repair of Dana Products.

Extreme care has been exercised in the design and selection of materials and manufacturing of these units. The slight outlay in personal attention and cost required to provide regular and proper lubrication, inspection at stated intervals, and such adjustments as may be indicated will be reimbursed many times in low cost operation and trouble free service.

In order to become familiar with the various parts of the product, it's principle of operation, troubleshooting, and adjustments it is urged that mechanics study the instructions in this manual carefully and use it as a reference when performing maintenance and repair operations.

Whenever repair or replacement of component parts is required, only Dana approved parts as listed in the applicable parts manual should be used. Use of "will fit" or non-approved parts may endanger proper operation and performance of the equipment. Dana does not warrant repair, replacement parts or failures resulting from the use of parts which are not supplied or approved by Dana. Important: Always furnish serial and model numbers when ordering parts.

SAFETY PRECAUTIONS

To reduce the chance of personal injury and/or property damaged, the following instructions must be carefully observed.

Proper service and repair are important to the safety of the service technician and the safe, reliable operation of the machine. If replacement parts are required the part must be replaced with a Dana specified replacement part. Do not use a replacement part of lesser quality.

The service procedures recommended in this manual are effective methods of performing service and repair. Some of these procedures require the use of purpose designed tools.

Accordingly, anyone who intends to use a replacement part, service procedure or tool which is not recommended must first determine that neither his safety or the safe operation of the machine will be jeopardized by the replacement part, service procedure or tool selected.

It is important to note that this manual contains various "Cautions and Notices" that must be carefully observed in order to reduce the risk of personal injury during service or repair. Improper service or repair may damage the unit or render it unsafe. It is important to understand that these "Cautions and Notices' are not exhaustive. It is impossible to warn of all possible hazardous consequences that may result from following or failing to follow these instructions.

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DESCRIPTION

The axle assembly has a bevel type ring gear and pinion with further reduction provided by a planetary gear set within the wheel hub.

Primary Reduction
The spiral bevel pinion and ring gear transmit power through the center differential pinions, side gears, and to the axle shaft. The spiral bevel differential assembly is mounted on tapered roller bearings which are adjusted by the positioning of the two threaded adjusting nuts mounted in the differential carrier and cap assembly. The pinion bearing preload is adjusted and maintained by a hardened and precision ground spacer positioned between inner and outer bearings. The spacer is selected at assembly.

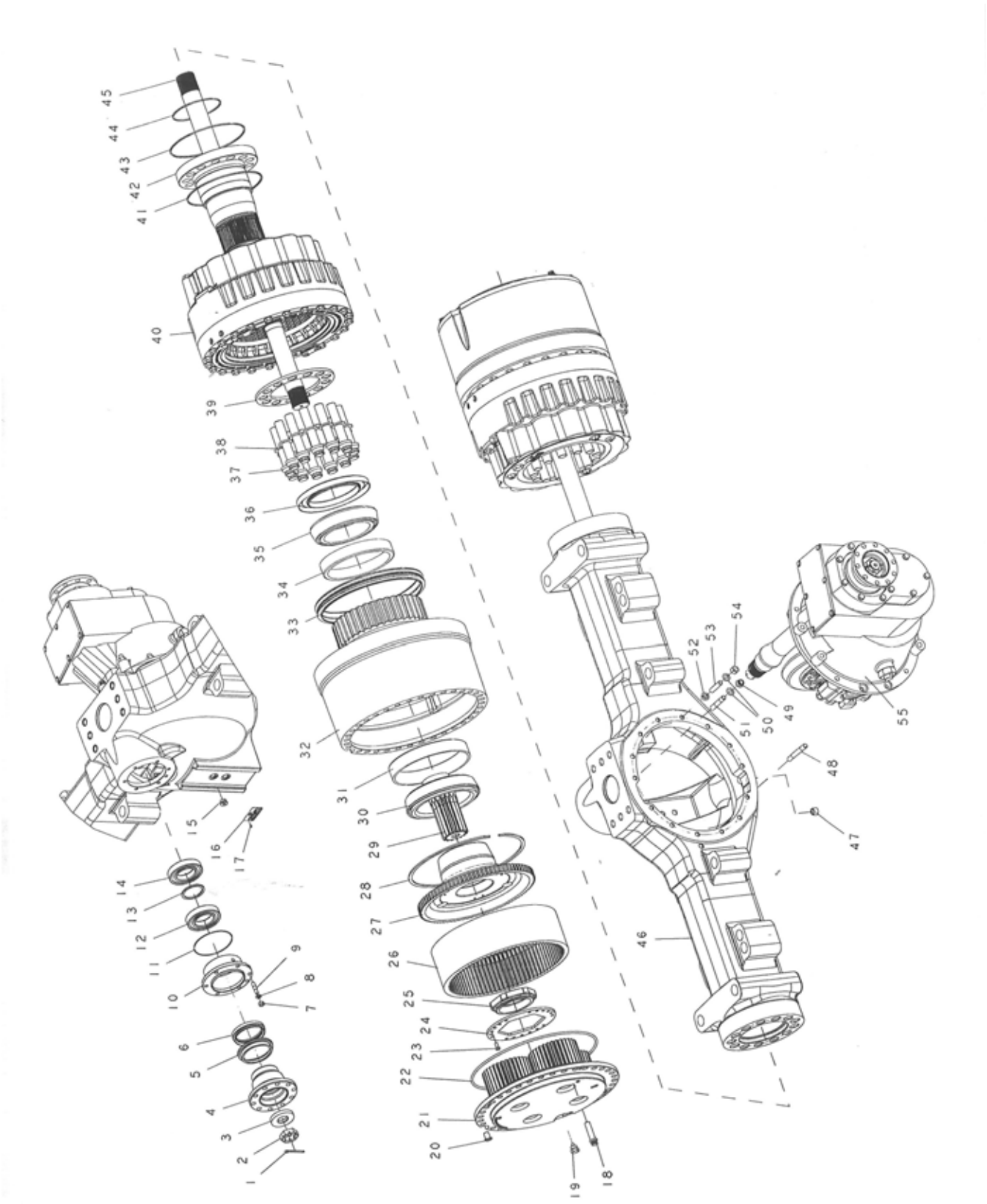
Secondary Reduction
In the wheel hub, a self-centering sun gear is spline fitted to the axle shaft and drives three planetary pinion gears. These gears in turn mesh with and react against a rigidly mounted internal ring gear. The planet gears rotate on needle roller bearings mounted on hardened and ground pins located in the planet carrier which in turn drive the wheel hub. Positive lubrication keeps all moving parts bathed in lubricant to reduce friction, heat and wear.

Posi-Stop (LCB) Liquid Cooled Brakes
The liquid cooled brake is ideal for use in contaminated or temperature sensitive environments and in machines where extra long maintenance intervals are required. Braking action of the Posi-Stop LCB is achieved through the application of the hydraulic piston and brake apply springs with the rotating friction surfaces which react with stationary stator plates. The stator plates are retained by scalloped tangs at the outside diameter, which in turn transfer the reaction torque to the rigid outside housing.

Hub splines are long enough to engage all friction discs before bearings or seals are set. This provides ease of service reassembly.

Wheel bearings are serviced as in any normal bearing service procedure.

AXLE ASSEMBLY EXPLODED VIEW

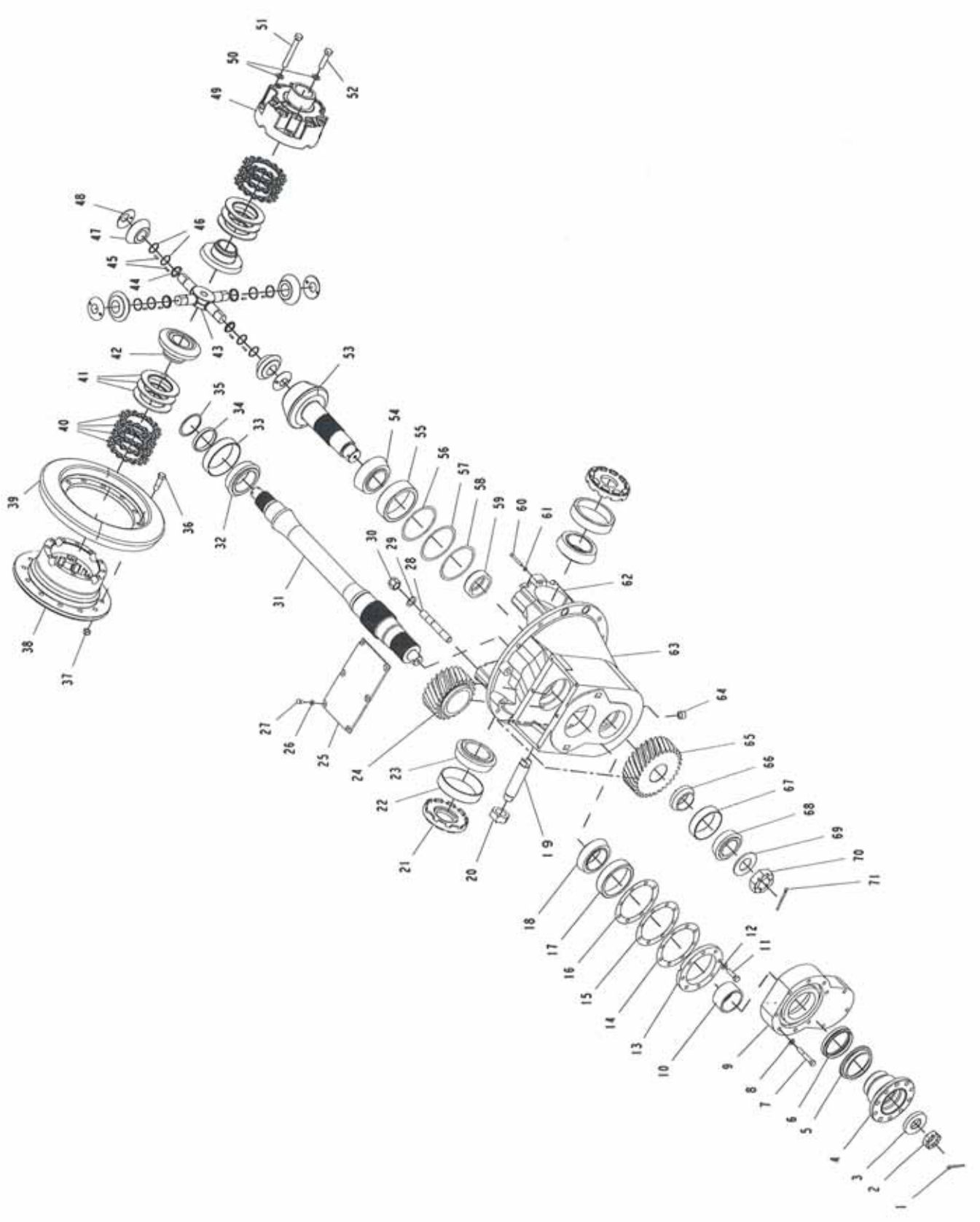


AXLE ASSEMBLY PARTS DESCRIPTION

Item	Description	Qty
1	Cotter Pin - Input & Drop Gear Shaft Nut	1
2	Nut - Input & Drop Gear Shaft Flange	1
3	Washer - Input & Drop Gear Shaft	1
4	Flange - Input & Drop Gear Shaft Output	1
5	Shield - Output Flange Dust	1
6	Oil Seal - Input & Drop Gear Shaft	1
7	Nut - Bearing and Seal Retainer	7
8	Lockwasher - Bearing and Seal Retainer	7
9	Stud - Bearing and Seal Retainer	7
10	Retainer - Bearing and Oil Seal	1
11	O-Ring - Bearing and Seal Retainer	1
12	Bearing - Roller	1
13	Spacer - Bearing	1
14	Bearing - Roller	1
15	Plug - Axle Housing Filler	1
16	Non Serviceable Item	N/A
17	Screw - Plate	2
18	Cap screw - Planetary Mounting	6
19	Plug - Planetary Level & Drain	2
21	Planetary Assembly	2
22	O-ring - Planetary Assembly Sealing	2
23	Cap screw - Adjusting Nut Lock	12
24	Lock Plate - Wheel Bearing Adjusting Nut	2
25	Nut - Wheel Bearing Adjusting	2
26	Gear - Internal	2
27	Internal Hub	2
28	Snap Ring	2

Item	Description	Qty
29	Gear - Sun	2
30	Cone - Outer Wheel Hub Bearing	2
31	Cup - Outer Wheel Hub Bearing	2
32	Hub - Wheel	2
33	Seal - Face	2
34	Cup - Inner Hub Bearing	2
35	Cone - Inner Hub Bearing	2
36	Oil Seal - Hub	2
37	Cap screw - Brake & Spindle Mounting	26
38	Washer - Brake & Spindle Mounting	26
39	Retaining Ring - Spindle	2
40	Brake Assembly	2
41	Sealing Ring - Brake To Spindle	2
42	Spindle	2
43	Sealing Ring - Spindle To Axle Housing	2
44	Sealing Ring - Spindle Pilot	2
45	Shaft - Axle	2
46	Housing - Axle	1
47	Plug - Magnetic Drain	1
48	Stud - Differential Mounting 3.687" Long	2
49	Nut - Differential Mounting	3
50	Washer - Differential Mounting	14
51	Stud - Differential Mounting 4.720" Long	2
52	Dowel Tapered - Differential Mounting	4
53	Stud - Differential Mounting 2.750" Long	10
54	Nut - Differential Mounting	11
55	Differential Assembly	1

DIFFERENTIAL AND CARRIER EXPLODED VIEW

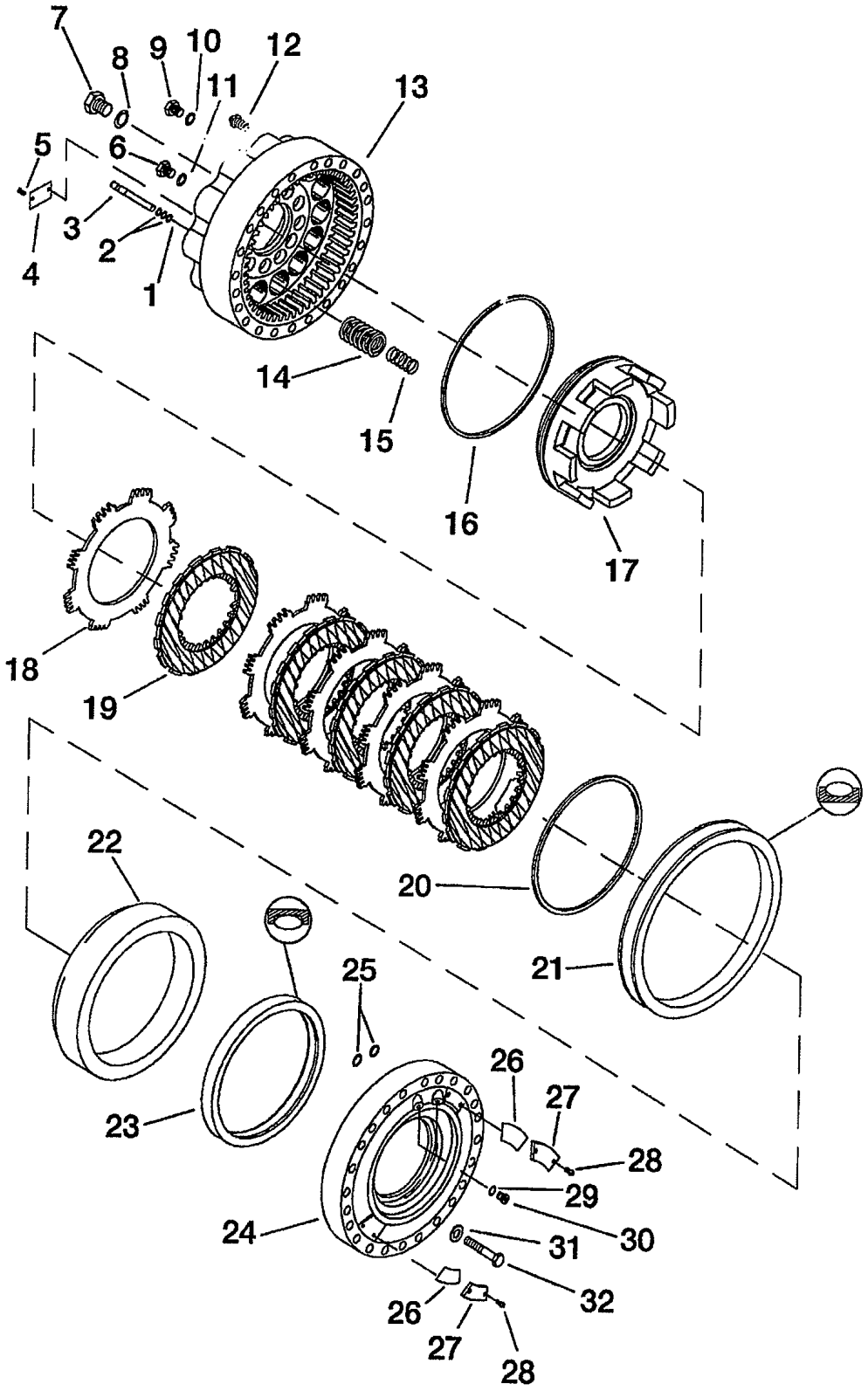


DIFFERENTIAL AND CARRIER PARTS DESCRIPTION

Item	Description	Qty
1	Cotter Pin - Input Flange Nut	1
2	Nut - Input Flange	1
3	Washer - Input Flange	1
4	Flange - Input	1
5	Shield - Input Flange Dust	1
6	Oil Seal - Input Shaft	1
7	Capscrew - Carrier Cover	11
8	Lockwasher - Carrier Cover Capscrew	11
9	Cover - Carrier	1
10	Spacer - Input Flange To Bearing	1
11	Capscrew - Input Shaft Bearing Retainer	8
12	Lockwasher - Input Shaft Brg. Retainer	8
13	Retainer - Input Shaft Outer Bearing	1
14	Shim - Input Shaft Bearing Retainer .004"	AR
15	Shim - Input Shaft Bearing Retainer .007"	AR
16	Shim - Input Shaft Bearing Retainer .010"	AR
17	Cup - Input Shaft Bearing	1
18	Cone - Input Shaft Bearing	1
19	Screw - Thrust	1
20	Nut - Thrust Screw	1
21	Nut - Differential Adjusting	2
22	Cup - Differential Bearing	2
23	Cone - Differential Bearing	2
24	Gear - Input Drop	1
25	Cover - Drop Gear Access	1
26	Lockwasher - Drop Gear Access Cover	6
27	Capscrew - Drop Gear Access Cover	6
28	Stud - Carrier Cap	4
29	Washer - Carrier Cap	4
30	Nut - Carrier Cap Stud	4
31	Shaft - Input and Drop Gear	1
32	Bearing Cone - Input Shaft	1
33	Bearing Cup - Input Shaft	1
34	Washer - Snap Ring	1
35	Snap Ring - Bearing Retaining	1

Item	Description	Qty
36	Capscrew - Ring Gear	12
37	Nut - Ring Gear Capscrew	12
38	Flanged Half - Differential Case	1
39	Gear - Ring	1
40	Clutch Disc - Differential Outer	8
41	Clutch Disc - Differential Inner	6
42	Side Gear - Differential	2
43	Spider - Differential	1
44	Spacer - Inner Bearing Roller	4
45	Roller - Bearing	232
46	Spacer - Center & Outer Bearing Roller	8
47	Gear - Differential Pinion	4
48	Washer - Pinion Thrust	4
49	Plain Half - Differential Case	1
50	Washer - Differential Case Capscrew	12
51	Capscrew - Differential Case	8
52	Capscrew - Differential Case	4
53	Gear - Pinion	1
54	Bearing Cone - Pinion Inner	1
55	Bearing Cup - Pinion Inner	1
56	Shim - Pinion Bearing Cup .004"	AR
57	Shim - Pinion Bearing Cup .007"	AR
58	Shim - Pinion Bearing Cup .010"	AR
59	Kit - Inner Pinion Bearing Spacer & Shim	1
60	Capscrew - Diff. Adjusting Nut Lock	2
61	Lockwasher - Diff. Adjusting Nut Lock	2
62	Cap - Carrier	2
63	Assembly - Differential Carrier & Cap	1
64	Plug - Drain	1
65	Gear - Pinion Drop	1
66	Spacer - Outer Pinion Bearing	1
67	Cup - Outer Pinion Bearing	1
68	Cone - Outer Pinion Bearing	1
69	Washer - Pinion Nut	1
70	Nut - Pinion	1
71	Cotter Pin - Pinion Nut	1

BRAKE EXPLODED VIEW

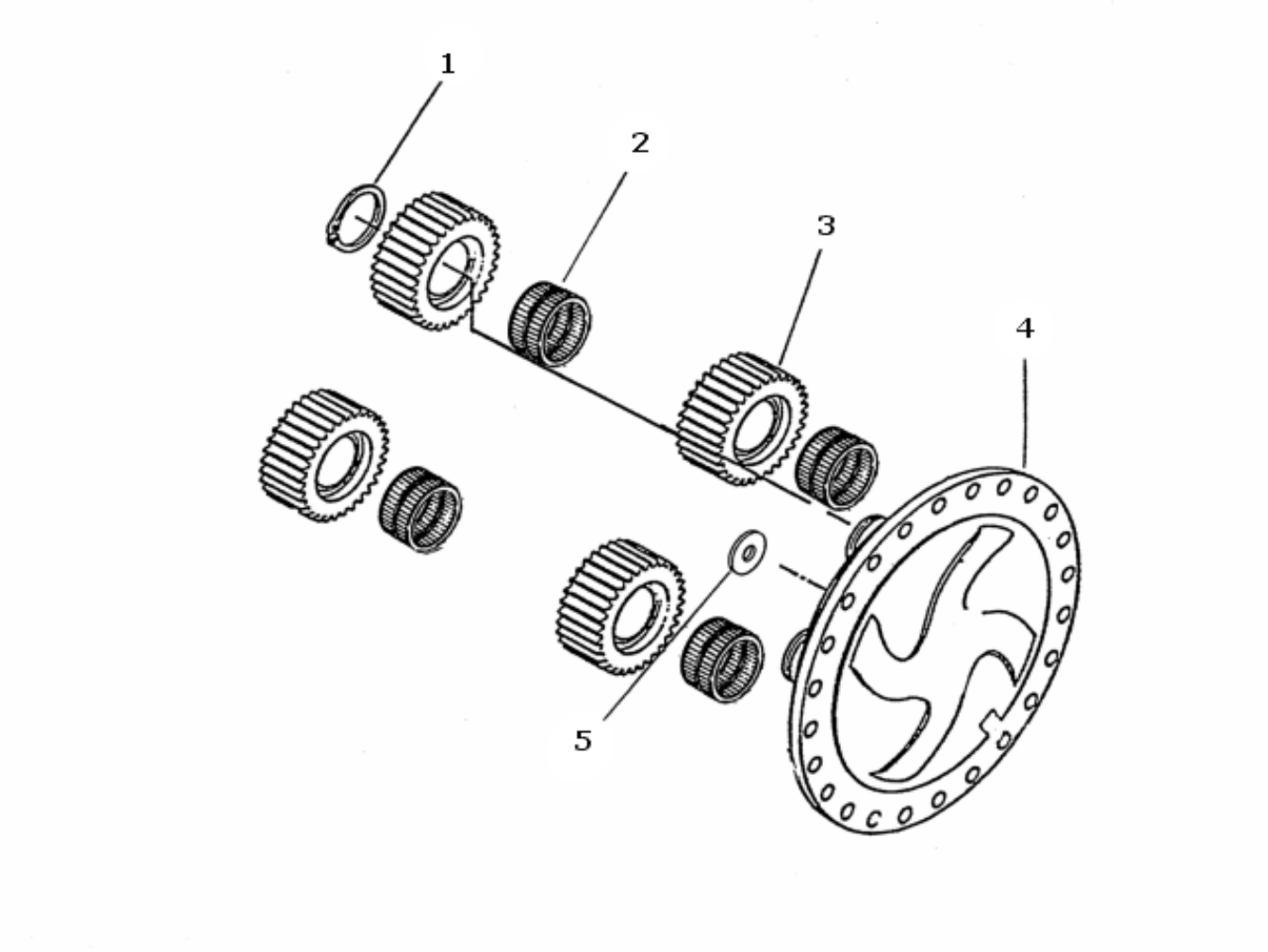


BRAKE PARTS DESCRIPTION

Item	Description	Qty
1	Snap Ring - Indicator	1
2	O-Ring - Indicator Pin	2
3	Pin - Wear Indicator	1
4 & 5	Non Serviceable Item	N/A
6	Plug - Actuating Port	1
7	Plug - Cooling Outlet Port	1
8	O-Ring - Cooling Outlet Port Plug	1
9	Plug - Cooling Outlet Port	1
10	O-Ring - Cooling Outlet Port Plug	1
11	O-Ring - Actuating Port Plug	1
12	Screw - Bleeder	1
13	Housing - Brake	1
14	Spring - Brake Apply Outer	15
15	Spring - Brake Apply Inner	15
16	Sealing Ring - Pressure Ring	1
17	Pressure Ring - Piston	1

Item	Description	Qty
18	Disc - Reaction	5
19	Disc - Friction	5
20	Sealing Ring - Brake Cover	1
21	Seal Assembly - Piston Outer	1
22	Piston - Brake	1
23	Seal Assembly - Piston Inner	1
24	Cover - Brake Outer	1
25	Sealing Ring - Port Square Cut	2
26	Sticker - Warning	2
27	Cover - Sticker	2
28	Capscrew - Sticker Cover	4
29	O-Ring - Port Plug	2
30	Plug - Port	2
31	Washer - Outer Cover Capscrew	24
32	Capscrew - Outer Cover Attaching	24

PLANET EXPLODED VIEW AND PARTS DESCRIPTION



Item	Description	Qty
1	Snap Ring - Planetary Gear Bearing	4
2	Bearing - Planetary Gear	4
3	Gear - Planetary	4

Item	Description	Qty
4	Carrier - Planetary	1
5	Washer - Sun Gear Thrust	1

OIL CHECKING PROCEDURE

Check lubricant level after each 250 hours of operation. Always maintain lubricant level to bottom of filler plug hole. Drain oil every 2,500 hours or within one year. To check oil level in axles with differential drive and planetary wheel ends, the axle should be run first, then allowed to stand for a minimum of five minutes on level ground. This procedure will allow oil to drain back to its normal level. After the five-minute interval, remove oil plug at axle center and in the planetary wheel ends for oil level inspection. If oil level is not at the bottom of the filler hole, add necessary lubricant.

CHECKING OIL LEVEL IN PLANETARY WHEEL ENDS

Always check lubricant in planetary wheel ends with arrow on the planetary carrier face in the 6:00 o'clock position. Remove oil level plug, if lubricant is below oil level hole add necessary lubricant.

DRAINING AXLE CENTER AND WHEEL ENDS

Draining is best accomplished immediately after the vehicle has been operating. The lubricant is then warm and will flow freely allowing full drainage in minimum time. This is particularly desirable in cold weather.

Remove plug at bottom of axle housing and the filler plug on the planetary wheel ends, making sure the planetary filler hole is down when draining. Allow sufficient time for the lubricant to drain, then replace plugs and refill with recommended lubricant.

When refilling be sure the arrow on the planetary carrier face is in the 6:00 o'clock position, allow the lubricant time to drain back to its normal level.

FLUSHING

After draining, axles should be flushed. Replace drain plugs and fill axles to the proper level with a #2 diesel fuel. Operate the vehicle for a short period of time in low gear and not more than 1500 engine rpm. Wide turns both left and right should be made to work the differential, then drain. Be sure to drain all of the flushing oil before refilling with new oil by following the draining procedure above, make sure all the flushing oil has been removed. Inspect the magnetic drain plug for metal particles or other foreign matter indicative of wear or possible failure. Then fill with the recommended lubricant.

Note: When filling the axle housing, planetary wheel ends, and brakes, allow enough time for lubricant to flow through the various components in the differential, planetary housing, and the brake assembly. After filling is completed, allow a few minutes for lubricant to attain its level and recheck each wheel end and the axle center. Add lubricant if necessary.

RECOMMENDED LUBRICANTS

Recommendations: Extreme pressure gear lubricant is recommended for use in all drive-steer and rigid drive axles except where explicitly stated differently by Spicer Off-Highway Products Engineering.

Mineral Based: Acceptable lubricants must meet API GL-5/MT or MIL-PRF2105E qualifications. The highest viscosity grade must be used given the prevailing ambient temperatures from the chart below.

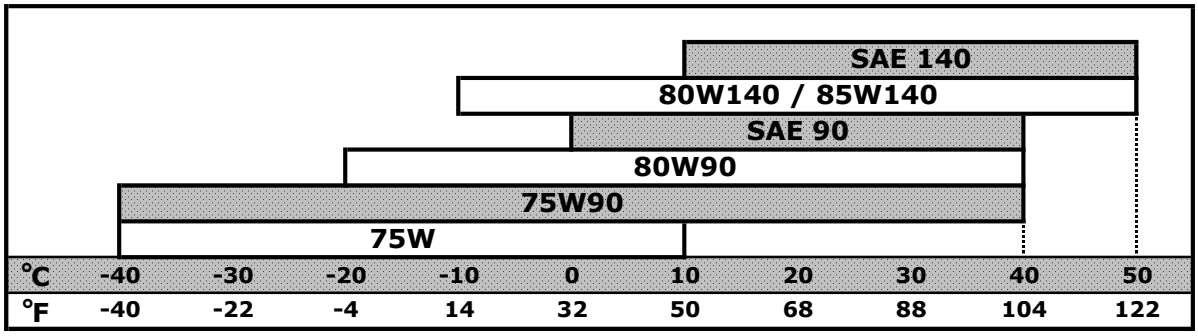
Synthetics: Synthetic lubricants are recommended providing they meet API GL-5/MT-1 qualifications. The highest viscosity grade must be used given the prevailing ambient temperatures from the chart below. In general synthetic oils have a lower pressure viscosity response than mineral oil lubricants as the contact pressure between the gears increases. This produces a thickening of the mineral oil at the contact point. This increase in viscosity helps to maintain lubricant film thickness reducing the possibility of surface and spalling fatigue. Synthetic lubricants do not thicken as much under pressure unless specifically formulated to do so. Before using a synthetic lubricant in heavy applications, the customer must check with the lubricant supplier on the issue of high-pressure lubricant applications.

Normal Oil Change Intervals: Oil change intervals for mineral based lubricants in normal environmental and duty cycle conditions is 1000 hours in all off-highway applications and 10,000 miles in on-highway applications. Severe or sustained high operating temperature or very dusty atmospheric conditions will result in accelerated deterioration or contamination. Judgment must be used to determine the required change intervals for extreme conditions.

Extended Oil Change Interval: Extended oil service may result when using synthetic lubricants. Appropriate change intervals must be determined for each application by measuring oxidation and wear metals over time to determine a baseline. Wear metal analysis can provide useful information, but an axle should not be removed from service based solely on this analysis. Vehicles, which are prone to high levels of ingested water in the axle, or water as a result of condensation, should not use extended drain intervals.

Friction Modifiers: Friction modifiers may be used with the lubricant to reduce Posi-Torq (limited slip) differential noise or liquid cooled brake noise. If friction modifiers re used, follow instructions on **TSB 278E**.

The use of aftermarket lubricant additives other than those specified is not recommended and may reduce the life of the axle and void the warranty!



Recommended Viscosity Grade Based on Prevailing Ambient Temperature

BEARING HEATING AND FREEZING GUIDELINES

Bearings often must be cooled or heated to aid in assembly or removal. Since temperature extremes can cause permanent bearing metallurgical damage, it is important to take proper precautions and use correct methods when heating and cooling bearings.

Cups that are to be assembled in hubs or housings with a press fit may be shrunk in a deep freeze unit. Standard class bearings should not be cooled below -65° F (-54° C). In addition to cooling the bearing cup, in some instances it may be necessary to heat the housing.

To control temperature, is best to use a thermostat along with a freezer unit or a properly calibrated thermometer. If a suitable freezer or thermometer is not available, your Timken service representative can suggest liquid combinations that freeze the bearing cup at the optimal temperatures. Regardless of the method, check the cup's final seating against the housing shoulder with feeler gauges.

Take extreme care that standard product bearings are never heated above 149° C [300° F]. If bearings are heated above this temperature, their metallurgical structure may soften, rendering them unsuitable for use.

There are a number of recommended methods for heating bearings. Electric ovens or electrically heated oil baths may be used, but only when accompanied by proper thermostatic control. If you use a hot plate to heat the oil, never rest bearings directly on the bottom of the pan. Instead, protect bearings from the heat source with a simple wire screen holder or similar device.

Use heat-resistant gloves to handle heated cones. Hold the hot cone solid against the cold shoulder on the shaft until the cone grabs on to the shaft. The hot cone will pull away from the cold shoulder unless it is held in position. Use .002 [.05 mm] feeler gages to make sure the cone is fully seated against the shoulder after the parts are cooled. Many loose bearing settings (excessive end play) are caused by an unseated cone working back against the shoulder in service.

CLEANING AND INSPECTION

CLEANING

Clean all parts thoroughly using solvent type cleaning fluid. It is recommended that parts be immersed in cleaning fluid and agitated slowly until parts are thoroughly cleaned of all old lubricants and foreign materials.

CAUTION: Care should be exercised to avoid skin rashes, fire hazards and inhalation of vapors when using solvent type cleaners.

BEARINGS

Remove bearings from cleaning fluid and strike larger side of cone flat against a block of wood to dislodge solidified particles of lubricant. Immerse again in cleaning fluid to flush out particles. Repeat above operation until bearings are thoroughly clean. Dry bearings using moisture free compressed air. Be careful to direct air stream across bearings to avoid spinning. Bearings may be rotated slowly by hand to facilitate the drying process.

HOUSINGS, COVERS AND CAPS

Clean interior and exterior of housings, bearing caps, etc., thoroughly. Cast parts may be cleaned in hot solution tanks with mild alkali solutions, providing these parts do not have ground or polished surfaces. Parts should remain in solution long enough to be thoroughly cleaned and heated. This will aid the evaporation of the cleaning solution and rinse water. Parts cleaned in solution tanks must be thoroughly rinsed with clean water to remove all traces of alkali. Cast parts may also be cleaned with steam cleaner.

CAUTION: Care should be exercised to avoid skin rashes and inhalation of vapors when using alkali cleaners. Thoroughly dry all parts cleaned immediately by using moisture-free compressed air or soft lintless absorbent wiping rags free of abrasive materials such as metal filings, contaminated oil or lapping compound.

INSPECTION

The importance of careful and thorough inspection of all parts cannot be overstressed. Replacement of all parts showing indication of wear or stress will eliminate costly and avoidable failures at a later date.

BEARINGS

Carefully inspect all rollers, cages and cups for wear, chipping or nicks to determine fitness of bearings for further use. Do not replace a bearing without replacing the mating cup or cone at the same time. After inspection, dip bearings in clean light oil and wrap in clean lint free cloth or paper to protect them until installed.

OIL SEALS, GASKETS AND RETAINING RINGS

Replacement of spring loaded oil seals, gaskets, and snap rings is more economical when unit is disassembled than to risk premature overhaul to replace these parts at a future time. Loss of lubricant through a worn seal may result in failure of other more expensive parts of the assembly. Sealing member should be handled carefully, particularly when being installed. Cutting, scratching or curling under lip of seal seriously impairs its efficiency. At reassembly, lubricate lips of oil seals with Multipurpose Lithium grease "Grade 2".

CLEANING AND INSPECTION - CONT.

GEARS AND SHAFTS

If Magna-Flux or a dye penetrant process is available use process to check parts. Examine teeth and the ground/polished surfaces of all gears and shafts carefully for wear, pitting, chipping, nicks, cracks, or scoring. If gear teeth are cracked or show spots where case hardening is worn through, replace with new gear. Small nicks may be removed with suitable hone stone. Inspect shafts to make certain they are not sprung, bent or have twisted splines.

HOUSINGS, COVERS AND CAPS

Inspect housings and covers to be certain they are thoroughly cleaned and that mating surfaces, bearing bores, etc. are free from nicks or burrs. Check all parts carefully for evidence of cracks or conditions which can cause oil leaks or failures.

AXLE REASSEMBLY

The reassembly instructions describe the procedure to be followed when reassembling and installing components of the axle. Instructions covering reassembly of opposite side are identical unless otherwise noted.

Important: Class 8.8, 10.9, 12.9, grade 5 and grade 8 fastening hardware has been used in the production of the axle assemblies covered in the manual. A table of proper torque values for the fastener classes above is provided within this manual. The class of hardware may be determined by the markings contained on the head of each capscrew. Class 12.9 or grade 8 torque values needs to be used on all socket head capscrews used with this assembly. Torque values specified in the text of this manual are for class 8.8, 10.9, 12.9, grade 5 and grade 8 hardware were presently used in production. On all axles being overhauled, bolts and capscrews should be identified as described above and torque value chart consulted for correct torque.

THREAD LOCKING COMPOUND

Guidelines for application where to apply:

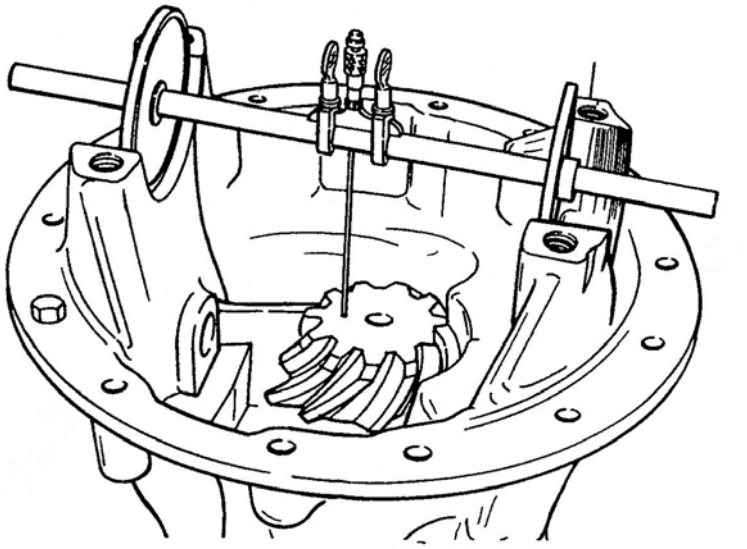
A. Bolts, capscrews, and studs (anchor end).

B. Nuts, apply compound to the male thread of the mating fastener.

C. Apply compound to coat the full length and circumference of thread engagement.

D. Remove excess compound from mating parts after fastener installation.

PINION DEPTH SETTING PROCEDURE



The function of the pinion setting gauge is to measure the distance from the centerline of the differential bearing bores to the ground surface on the gear end of the pinion. This measurement when subtracted from the value etched on the ring gear will indicate the size of the shim pack required to position the pinion gear in proper relation to the ring gear.

On the outer diameter of the ring gear, a ring gear to pinion distance will be etched, add .4649 [11.808 mm] to it. (.4649 [11.808 mm] is half the thickness of the gauge bar). Record this value. This value may be different on each ring and pinion set due to manufacturing variations.

Use a file and emery cloth to remove all burrs and nicks from machined bearing surfaces of carrier housing.

Paint bearing surfaces with bearing contact checking compound.

Insert an extension depth micrometer (Starrett #44B-6RC and extension #99347 7" [178 mm] or equivalent is recommended) into the guide bore of the micrometer arbor and slide clamps over base of micrometer. With the thumb screws reacting on base, secure micrometer.
IMPORTANT: The micrometer extension must pass freely through the micrometer bar guide bore and base of the micrometer must rest on the micrometer arbor when mounted.

Mount adapter discs on micrometer arbor and set in position in carrier housing. Exercise care to be sure that micrometer and extension do not contact any part of the carrier in this operation. Apply pressure by hand and rotate adapter discs slightly to obtain a contact with bearing surfaces.

Remove checking gauge assembly and check for full bearing contact on bearing surfaces.

If contact is full and proper, again position checking gauge assembly in carrier and check distance to ground surface on pinion. Do not apply pressure to arbor or micrometer. Turn micrometer carefully and evenly until the flat tip of the micrometer extension contacts the ground surface of the pinion squarely. Subtract this reading from the value previously recorded and this equals the amount of shims to be added between the inner pinion bearing cup and the carrier housing.

EXAMPLE:

5.289 [134.341 mm] Value etched on ring gear.
+0.469 [011.913 mm] Constant (1/2 thickness of gauge bar).
5.758 [146.253 mm] Total
-5.728 [145.491 mm] Initial micrometer reading.
0.030 [.762 mm] Add this value in shims under inner pinion bearing cup.

WHEEL BEARING ADJUSTING INSTRUCTIONS WITH POSI-STOP BRAKE

1. Before wheel bearing adjustment is made it is imperative all tapered bearing cones and cups be pressed to fully seated position. Do not attempt to seat cups and cones by tightening spindle nut against internal gear hub as this is not an effective method of seating the components and damage may occur.

2. Coat face of spindle nut, spindle threads and splines with Anti-Seize or Never-Seez.

3. Install spindle nut and tighten to 1200 LBF/FT [1627 Nm]. Shock internal gear hub with heavy bar while rotating wheel hub a minimum of 2 revolutions. Recheck nut torque, if nut moves re-torque to 1200 LBF/FT [1627 Nm] and repeat shocking and rotating. Repeat process until the spindle nut does not advance when tightened.

4. Loosen the spindle nut ¼ to ½ turn and shock the wheel hub until a slight amount of bearing end play is achieved and the wheel hub can rotate freely.

5. Using a strap, hoist and scale or torque wrench and adapter bar, determine the rolling torque of the wheel end with the bearings in a no load condition. Due to the imbalance of the hub assembly there will be a variation in rolling torque as the wheel hub is rotated. Record the maximum rolling torque figure observed while the hub is being rotated. This figure will be the "No-Load" rolling torque.

6. The acceptable no-load value should be between 10–50 LBF/FT [14-68 Nm]. If higher than this open brake bleeder, rotate hub and shock brake to release brake. If brake doesn't release apply 3 PSI [12 kPa] to cooling cavity of brake with bleeder open. Record no-load value.

   NOTE:
   The specifications given are for axles using new parts. For service on axles with used parts the procedure is the same except the minimum allowable rolling torque can be as low as 5 LBF/FT [7 Nm].

7. Tighten spindle nut to 600 LBF/FT [813 Nm]. Advance the nut until 3 pairs of holes in the lock plate line up with the holes in the internal gear hub.

8. Check wheel hub rolling torque, it must be within the specified range as listed below. If rolling torque is higher than specified reduce the nut torque to obtain an acceptable reading, but not less than 400 LBF/FT [542 Nm]. If spindle nut torque must be reduced below 400 LBF/FT [542 Nm] there is likely a concentricity or alignment issue in the hub assembly and it should be disassembled and inspected and reassembled as required.

9. If rolling torque is lower than specified increase spindle nut torque until preload is in specified range with lock plate holes aligned. Do not torque to more than 1400 LBF/FT [1898 Nm]. Recheck rolling torque after rotating the wheel hub at least 5 times.

10. Install lock plate and screws and tighten to 35-40 LBF/FT [47-54 Nm].

Note: Bearing preload should be 50-80 LBF/FT [68-108 Nm] over no-load.

FACE SEAL INSTALLATION INSTRUCTIONS

1. Clean wheel hub and brake housing bores with solvent prior to installation of the seal.
2. Keep original mated metal sealing rings as a set for wheel hub and brake cover (DO NOT INTERMIX METAL RINGS).
3. All parts of seal should be free of grease, oil, dirt and scale.
4. Sealing rings must be handled with care. Lapped sealing faces must not be damaged, scratched or contaminated with dirt or grease.
5. When installing the rubber toric on the seal ring, make sure that it is uniformly seated on the retaining lip and is not twisted. Place the seal in the installation tool and locate this assembly squarely against the housing. Use sudden and even pressure against the tool to push the toric under the retaining lip of the housing cavity. Insure that the toric is uniformly captured under the housing cavity retaining lip and is not twisted or pinched. The seal ring face should be parallel to the housing within .040 [1.0 mm].
6. After installing the seal halves into the wheel hub and brake housing, wipe both metal sealing surfaces clean with lint free cloth. Then apply a coat of clean MS8 oil to the metal seal faces with a lint free applicator. Oil must not wet surfaces other than sealing faces.

POSI-STOP BRAKE PRESSURE TEST INSTRUCTIONS

1. **Air Pressure Decay Test and Criteria**
   A. After completing assembly and with bleeder plugged, apply 12 PSI [83 kPa] air pressure to the brake fluid actuation port. Shut off air at inlet to hold pressure on brake.
   B. Let pressure stabilize for 30 seconds. This is to compensate for temperature change, piston movement and seating of seal lips.
   C. Re-pressure to 12 PSI [83 kPa] if required and hold for 15 seconds with no pressure drop.
   D. Repeat re-pressuring until 12 PSI [83 kPa] holds for 15 seconds minimum, but not over 3 repressurings.
   E. If after 3 re-pressurings brake will still not hold pressure, tear down and determine cause of leak, rebuild and retest.
2. **Air and Hydraulic Pressure Test**
   A. After completing assembly, with bleeder plugged apply 100 PSI [689 kPa] air pressure to the brake fluid actuation port. Shut off air at inlet to hold pressure on brake. Brake should maintain pressure for 30 seconds without drop.

   B. Apply 1500 +50/-00 PSI [10342 +344/-000 kPa] hydraulic pressure using mineral oil to brake actuation port, shut off pressure at inlet to hold pressure on brake. Inspect to insure that pressure plate has moved against housing stop and that friction discs are released and free. Maintain pressure for 30 seconds minimum without drop. Repeat twice. If brake will not maintain pressure, tear down and determine cause of leak, rebuild and retest.

AXLE PRESSURE TEST INSTRUCTIONS

1. If brake assembly is disassembled or partially disassembled, the pressure apply fluid actuation test must be performed per the Brake Pressure Test Instructions.

2. If brake assembly is not disassembled or partially disassembled before mounting to axle, no pressure apply fluid check is required.

Pressure test axle as follows:

A. Remove drain plugs from both brakes.

B. Apply 12 PSI [83 kPa] air pressure to complete axle (Normally thru axle housing breather hole) and shut air off at inlet to lock pressure on axle.

C. Axle must hold 12 PSI [83 kPa] for 15 seconds with no drop in pressure.

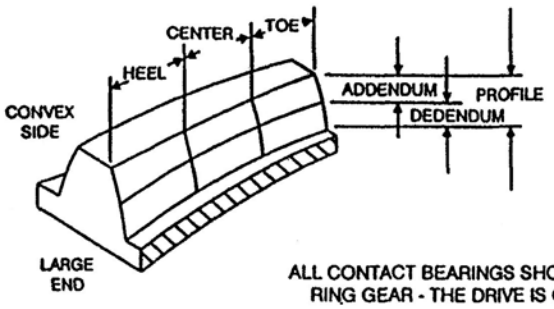
D. If leaks occur, determine cause, rebuild and retest (see (1) above also).

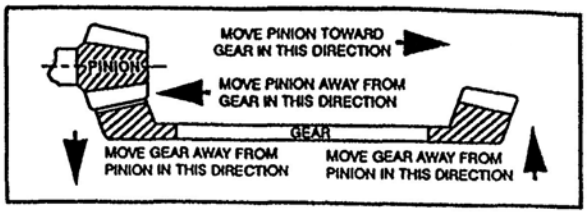
E. If no leaks occur, make sure cooling ports are plugged , apply 12 PSI [83 kPa] air pressure to drain port of each brake, shut off air at inlet to lock pressure on brake cavity.

F. Each brake cavity must hold 12 PSI [83 kPa] for 15 seconds with no drop in pressure.

G. If leaks occur, determine cause, rebuild and retest starting at (A) (see (1) above also).

GEAR TOOTH CONTACT CHART – LH




MOVE PINION TOWARD GEAR IN THIS DIRECTION
PINION
MOVE PINION AWAY FROM GEAR IN THIS DIRECTION
GEAR
MOVE GEAR AWAY FROM PINION IN THIS DIRECTION
MOVE GEAR AWAY FROM PINION IN THIS DIRECTION

ALL CONTACT BEARINGS SHOWN BELOW ARE ON <u>LEFT HAND</u> SPIRAL RING GEAR - THE DRIVE IS ON THE CONVEX SIDE OF THE TOOTH.

FIG.1
TYPICAL PREFERRED BEARING ON BOTH SIDES OF TOOTH WHILE UNDER A LIGHT LOAD

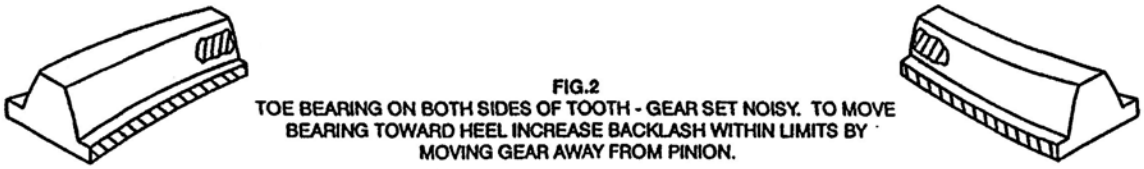


FIG.2
TOE BEARING ON BOTH SIDES OF TOOTH - GEAR SET NOISY. TO MOVE BEARING TOWARD HEEL INCREASE BACKLASH WITHIN LIMITS BY MOVING GEAR AWAY FROM PINION.

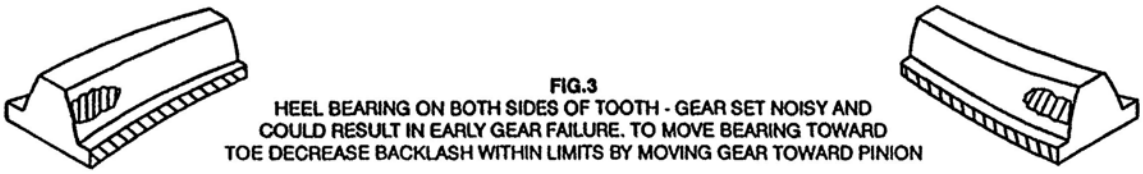


FIG.3
HEEL BEARING ON BOTH SIDES OF TOOTH - GEAR SET NOISY AND COULD RESULT IN EARLY GEAR FAILURE. TO MOVE BEARING TOWARD TOE DECREASE BACKLASH WITHIN LIMITS BY MOVING GEAR TOWARD PINION

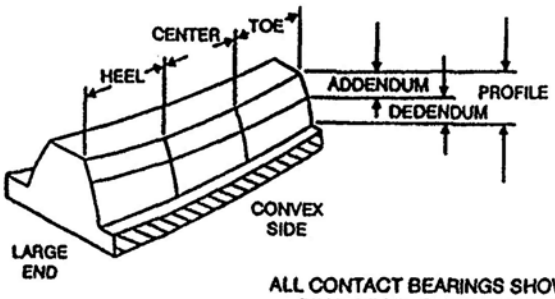
FIG.4
LOW BEARING ON GEAR AND HIGH BEARING ON PINION. CORRECT BY PULLING PINION AWAY FROM GEAR (INCREASE MOUNTING DISTANCE)

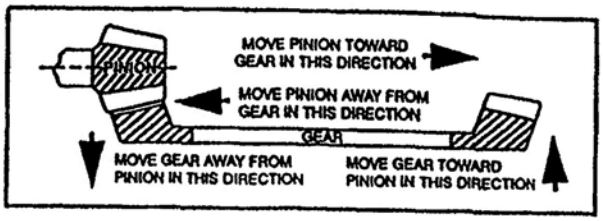
FIG.5
HIGH BEARING ON GEAR AND LOW BEARING ON PINION. CORRECT BY MOVING PINION TOWARD GEAR (DECREASE MOUNTING DISTANCE)

BACKLASH

BACKLASH SHOULD BE MEASURED WITH A DIAL INDICATOR RIGIDLY MOUNTED WITH THE STEM PERPENDICULAR TO THE TOOTH SURFACE AT THE EXTREME HEEL. SEE SHEET NO. 2 FOR BACKLASH VALUES.

GEAR TOOTH CONTACT CHART - RH




PINION
MOVE PINION TOWARD GEAR IN THIS DIRECTION
MOVE PINION AWAY FROM GEAR IN THIS DIRECTION
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MOVE GEAR TOWARD PINION IN THIS DIRECTION

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FIG.1
TYPICAL PREFERRED BEARING ON BOTH SIDES OF TOOTH WHILE UNDER A LIGHT LOAD

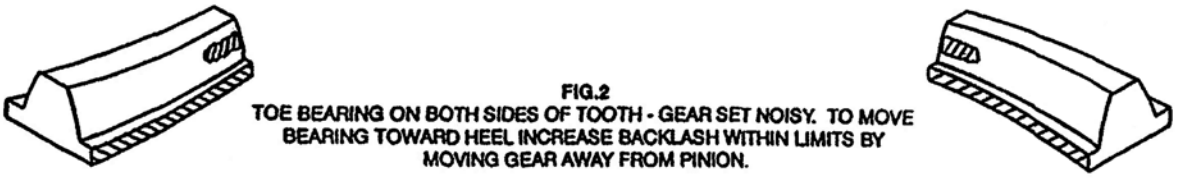

FIG.2
TOE BEARING ON BOTH SIDES OF TOOTH - GEAR SET NOISY. TO MOVE BEARING TOWARD HEEL INCREASE BACKLASH WITHIN LIMITS BY MOVING GEAR AWAY FROM PINION.

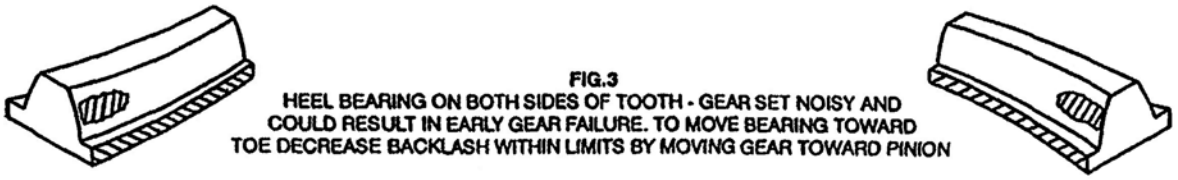

FIG.3
HEEL BEARING ON BOTH SIDES OF TOOTH - GEAR SET NOISY AND COULD RESULT IN EARLY GEAR FAILURE. TO MOVE BEARING TOWARD TOE DECREASE BACKLASH WITHIN LIMITS BY MOVING GEAR TOWARD PINION

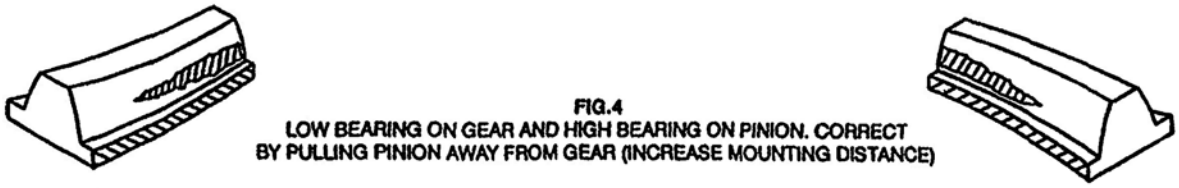

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FIG.5
HIGH BEARING ON GEAR AND LOW BEARING ON PINION. CORRECT BY MOVING PINION TOWARD GEAR (DECREASE MOUNTING DISTANCE)

BACKLASH

BACKLASH SHOULD BE MEASURED WITH A DIAL INDICATOR RIGIDLY MOUNTED WITH THE STEM PERPENDICULAR TO THE TOOTH SURFACE AT THE EXTREME HEEL. SEE SHEET NO. 2 FOR BACKLASH VALUES.

FASTENER TORQUE CHART

STANDARD FASTENERS Lubricated and Plated Bolts, CapScrews, and Studs				
	Grade 5		Grade 8	
	3 Radial Dashes On Bolt Head		6 Radial Dashes On Bolt Head	
Size	LBF/FT	[Nm]	LBF/FT	[Nm]
1/4-20	10	14	11	15
1/4-28	11	15	13	18
5/16-18	16	22	30	41
5/16-24	20	27	32	43
3/8-16	25	34	36	49
3/8-24	29	39	41	56
7/16-14	41	56	57	77
7/16-20	45	61	64	87
1/2-13	63	85	88	119
1/2-20	70	95	99	134
9/16-12	90	122	127	172
9/16-18	100	136	141	191
5/8-11	124	168	175	237
5/8-18	141	191	198	268
3/4-10	220	298	310	420
3/4-16	245	332	347	470

METRIC FASTENERS Lubricated and Plated Bolts, CapScrews, and Studs						
	Class 8.8		Class 10.9		Class 12.9	
	8.8 on Bolt Head		10.9 on Bolt Head		12.9 on Bolt Head	
Size	LBF/FT	[Nm]	LBF/FT	[Nm]	LBF/FT	[Nm]
M4	2.2	3	3.2	4.4	7.4	10
M5	4.4	5.9	6.4	8.7	7.4	10
M6	7.4	10	11	15	13	18
M8	18	25	26	36	32	43
M10	36	49	51	72	62	84
M12	63	85	92	125	107	145
M14	100	135	147	200	173	235
M16	155	210	229	310	269	365
M18	221	300	317	430	369	500
M20	313	425	450	610	524	710
M22	428	580	605	820	708	960
M24	538	730	774	1050	900	1220

PLUG AND ELASTIC STOP NUT TORQUE CHARTS

O-RING PLUGS			
Size	**P/N**	**LBF/FT**	**[Nm]**
5/16-24	24K-1	5	7
3/8-24	24K-2	8	11
7/16-20	24K-3	10	14
1/2-20	24K-4	13	18
9/16-18	24K-5	15	20
3/4-16	24K-6	25	34
7/8-14	24K-7	35	47
1 1/16-12	24K-8	50	68
1 3/16-12	24K-9	60	81
1 5/16-12	24K-10	75	102
1 5/8-12	24K-11	85	115
1 7/8-12	24K-12	85	115

PIPE PLUGS		
Size (NPTF)	**LBF/FT**	**[Nm]**
1/16-27	7	9
1/8-27	10	14
1/4-18	20	27
3/8-18	30	41
1/2-14	35	47
3/4-14	45	61
1-11 1/2	55	75
1 1/4-11 1/2	65	88

ELASTIC STOP NUTS		
Size	**LBF/FT**	**[Nm]**
1-20	200	270
1 1/4-18	250	340
1 1/2-18	350	475
1 3/4-12	450	610

DISASSEMBLY

Planetary Removal

Figure 1
Drain oil from wheel ends, brakes, and center section.

Figure 2
Remove (3) planet carrier screws.

Figure 3
Pry planet carrier out of wheel hub enough to install chain clevis.
CAUTION: Use care not to over extend planet carrier as serious injury can result.

Figure 4
Install chain clevis.

Figure 5
Attach chain.

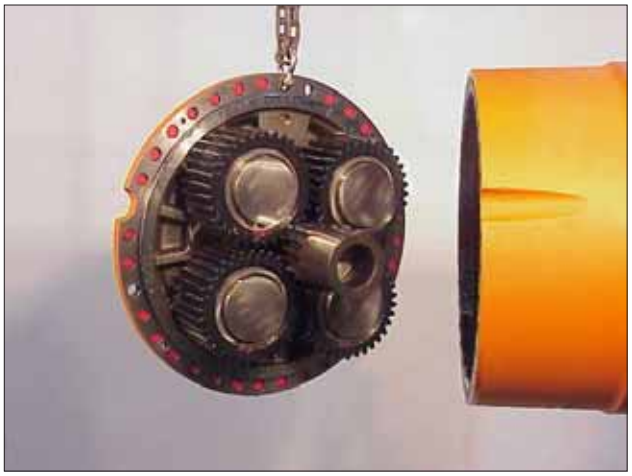


Figure 6
Remove planet carrier from hub.

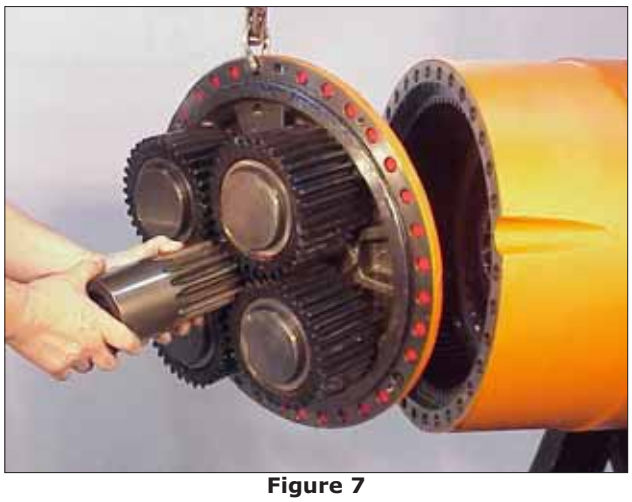


Figure 7
Remove sun gear.

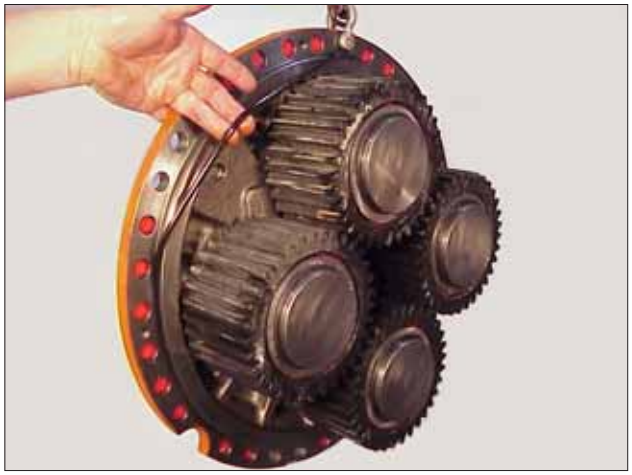


Figure 8
Remove planet carrier o-ring.

Axle Shaft and Hub Removal

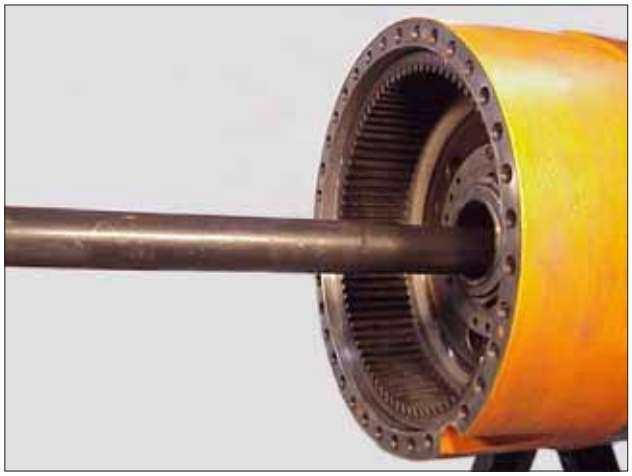


Figure 9
Remove axle shaft.

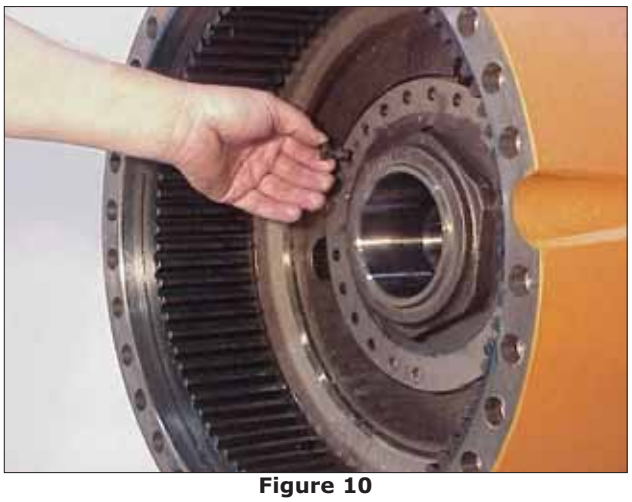


Figure 10
Remove (6) lock plate screws.

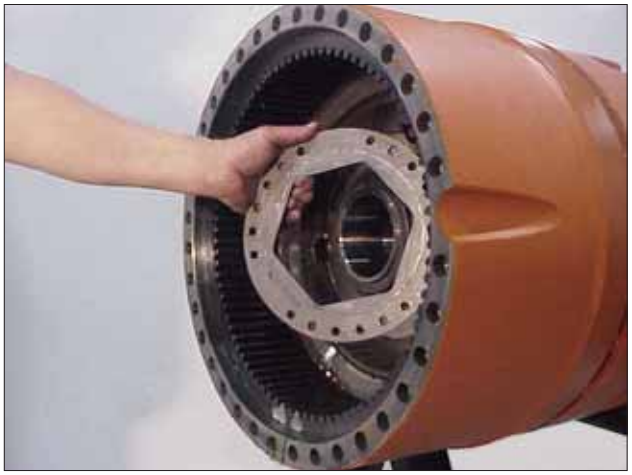


Figure 11
Remove spindle nut lock plate.

Figure 12
Remove spindle nut.

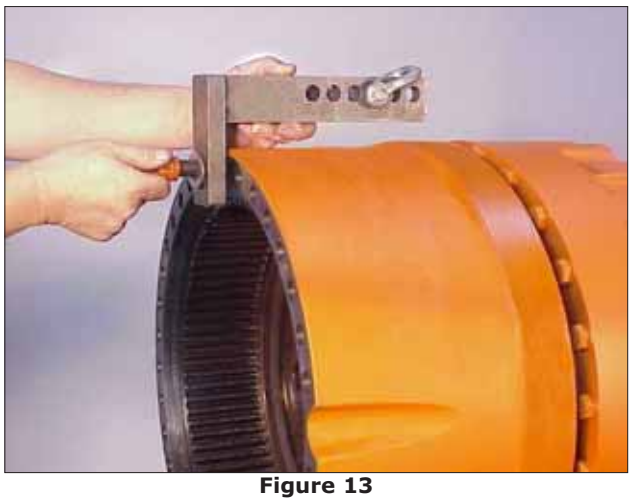


Figure 13
Install lifting device
Refer to tool drawing on page 99.

Figure 14
Install (2) screws with flat washers at 4:00 & 8:00 positions as shown to retain internal gear.

Figure 15
Remove hub assembly.

Face Seal Removal

Figure 16
Carefully pry face seal from hub. Avoid making contact with seal bore or sealing surfaces that could cause damage and leaks.

Figure 17
Remove face seal from hub.

Figure 18
Remove face seal from brake housing.

Brake and Spindle Removal

Figure 19
Remove (1) brake cover attaching screw at 12:00 position.

Figure 22
Loosen top mounting screw.
An 18 to 1 torque multiplier is shown.

Figure 20
Install lifting device.
Refer to tool drawing on page 99.

Figure 23
Remove spindle mounting screw as shown.

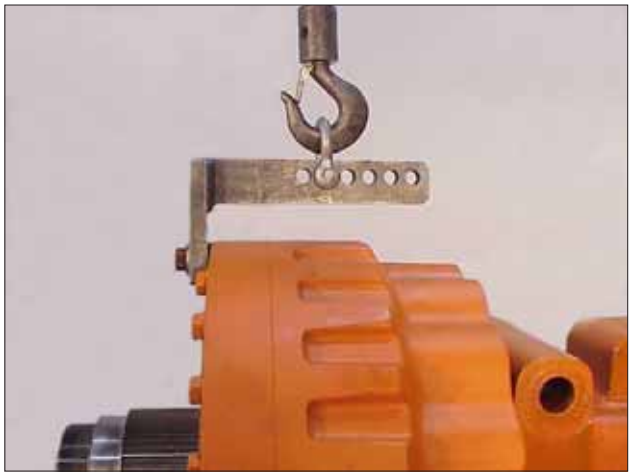


Figure 21
Attach chain. Approximate balance point is shown.

Figure 24
Install alignment pin.

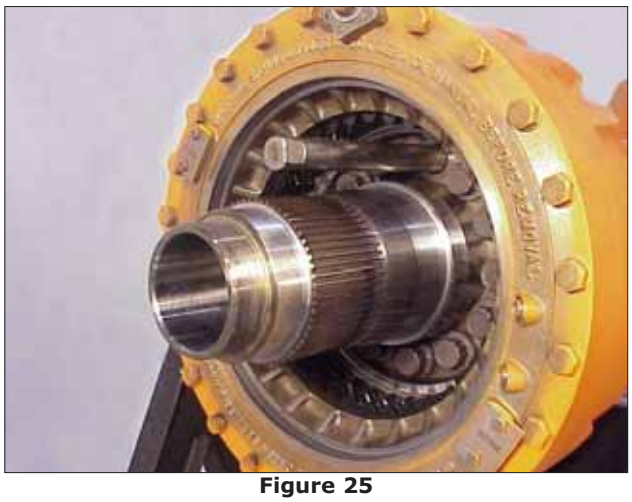


Figure 25
Threaded end of pin must engage threads in axle housing a minimum of 1.5 times pin diameter or 2.0 [50.8 mm].

Figure 26
Remove remaining (12) brake and spindle mounting screws.

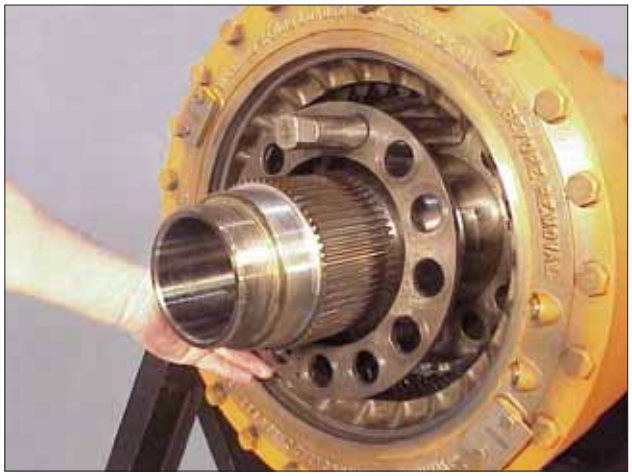


Figure 27
Remove spindle retaining ring.

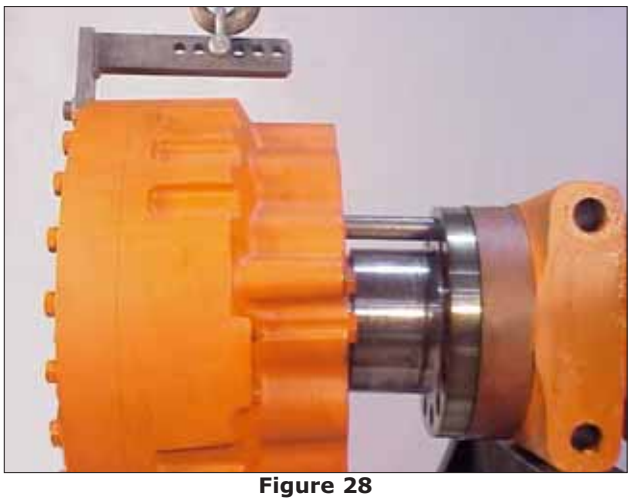


Figure 28
Carefully remove brake assembly.

Figure 29
Remove brake to spindle seal ring.

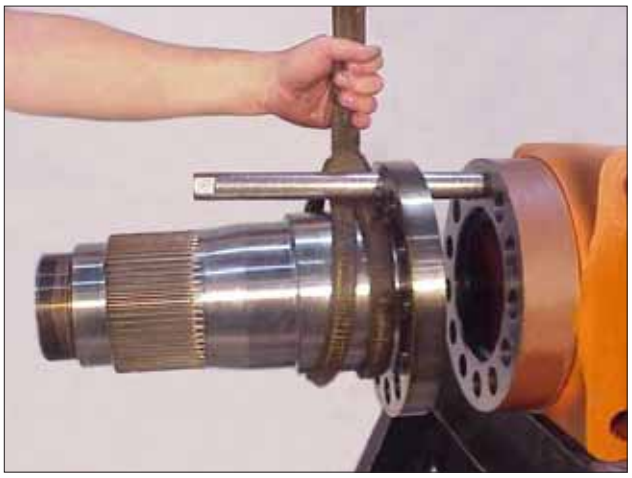


Figure 30
Remove spindle.
CAUTION:
Spindle is heavy and weighted off center.
IMPORTANT:
Do not clean/chase axle housing threads using a tap.

Figure 31
Remove spindle pilot seal ring.

Figure 34
Remove output flange dust shield.
NOTE: Remove only if replacement is required.

Figure 32
Remove spindle to axle housing seal ring.

Figure 35
Pry bearing and oil seal retainer away from axle housing and remove. Using appropriate puller remove outer roller bearing, bearing spacer and inner roller bearing.

Output Flange and Bearing Removal

Figure 33
Remove cotter pin, flange nut, washer, output flange, and (7) bearing & oil seal retainer nuts and lockwashers.

Figure 36
Remove bearing and oil seal retainer o-ring.

Figure 37
Remove oil seal as shown or drive out from back side with a punch.

Differential and Carrier Assembly Removal

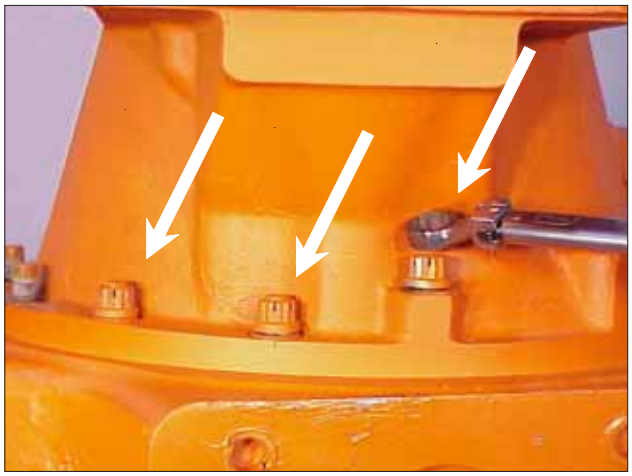


Figure 38
Remove (3) 12 point differential mounting nuts and washers.

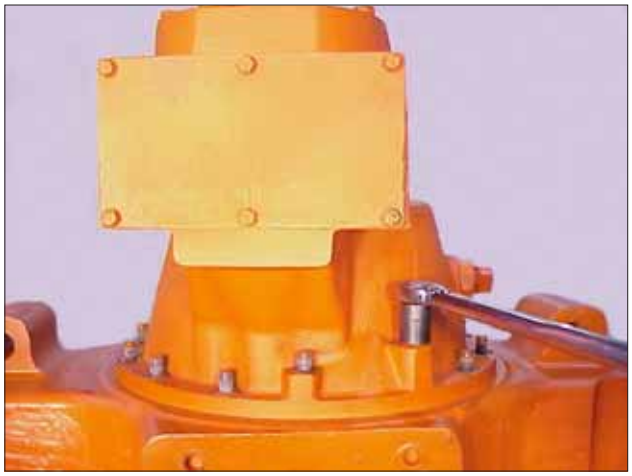


Figure 39
Remove (11) differential mounting nuts and washers.

Figure 40
Remove (4) tapered dowels.

Figure 41
Remove (2) carrier cover screws on horizontal center line of pinion shaft.

Figure 42
Install lifting chain with (2) screws and flat washers.
NOTE: Length of screws must be the length of the screws removed plus the thickness of the chain used to assure adequate engagement of threads.

Figure 43
Remove differential and carrier assembly.

Planetary Disassembly

Figure 44
Remove (4) retaining rings.

Figure 45
OPTIONAL: Apply heat to inner bearing race to facilitate removal. Refer to bearing heating and freezing guidelines on page 14.

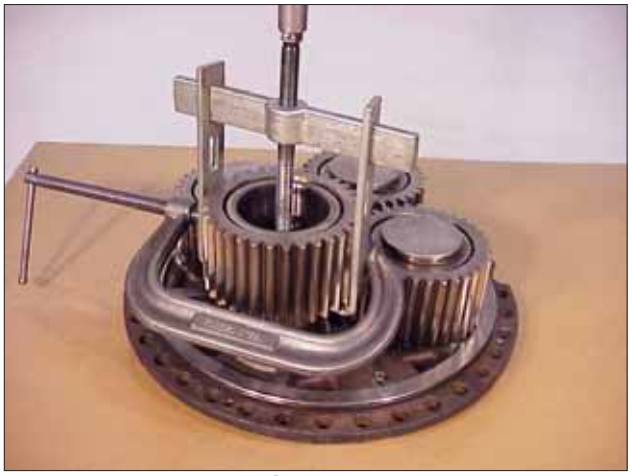


Figure 46
Remove (4) gear and bearing assemblies.
Inspect bearing contact surfaces for wear and damage.

Figure 47
Remove thrust washer as shown.

Clean and inspect all components.
Repair or replace components as required.

Hub Disassembly

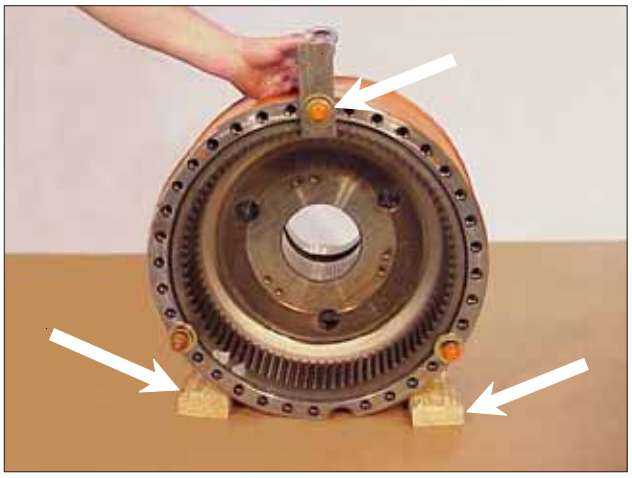


Figure 48
Block hub to secure as shown. Remove lifting device.

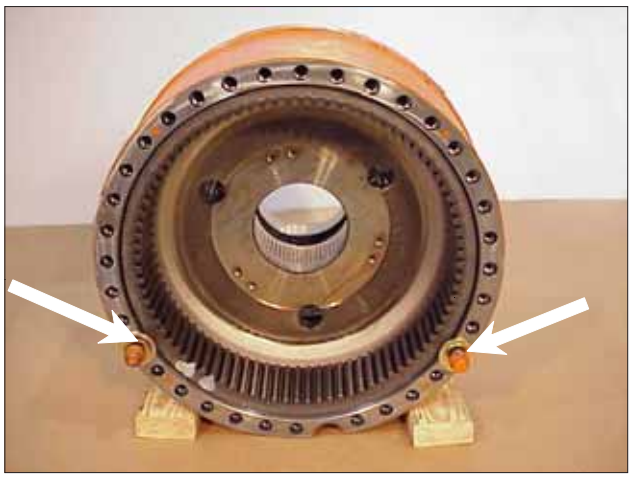


Figure 49
Remove (2) screws and flat washers.

Figure 50
Carefully remove internal ring gear and hub assembly from hub.
CAUTION: Ring gear assembly is heavy.

Refer to exploded view and parts description on pages 5 and 6 for this procedure.

Figure 51
Remove internal ring gear snap ring (Item 28). Separate internal gear hub (Item 27) from internal ring gear (Item 26).

Figure 52
OPTIONAL: Apply heat to inner race of bearing cone to facilitate removal. Refer to bearing heating and freezing guidelines on page 14. **NOTES:** If using heat immediately proceed to step in ***figure 53*** before bearing cools.
NOTE: Internal ring gear assembly not as shown.

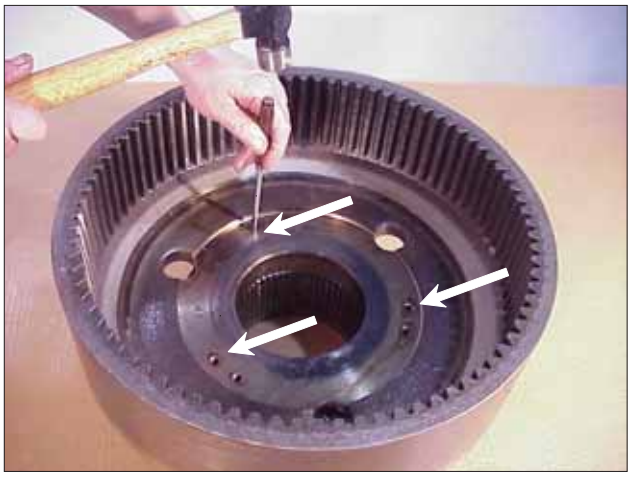


Figure 53
Remove bearing cone using punch as shown.
NOTE: Internal ring gear assembly not as shown.

Figure 54
Remove hub seal as shown or drive bearing cone and seal out from other side.

Figure 55
Remove hub seal and bearing cone.

Figure 56
Remove outer wheel bearing cup.

Figure 57
Remove inner bearing cup.

Posi-Stop Brake Disassembly

Figure 58
Remove (4) warning sticker cover screws.

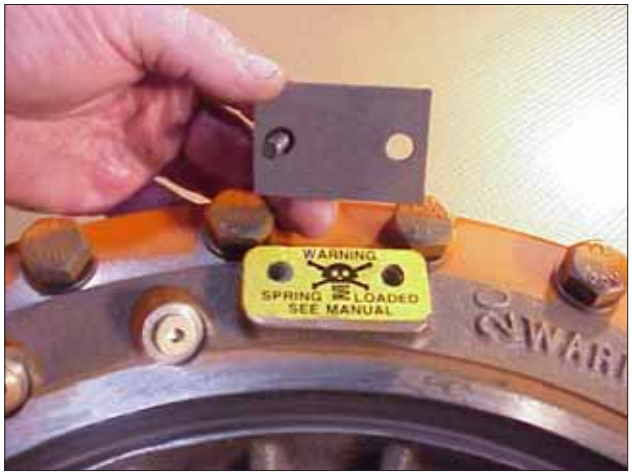


Figure 59
Remove (2) warning sticker covers. **Note Warning!**

Figure 60
Note warning cast into brake cover.

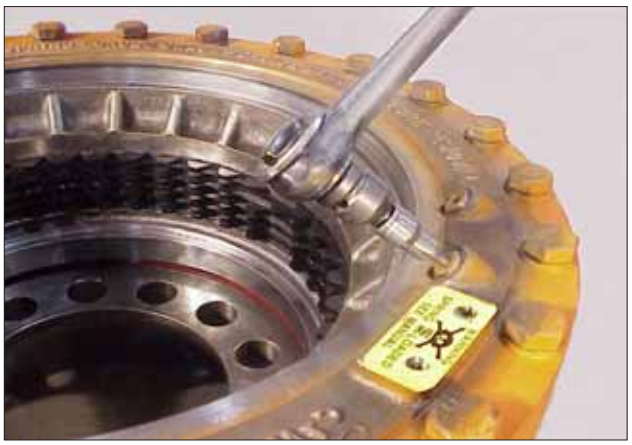


Figure 61
Remove (2) pressure port plugs.

Brake Cover Removal

Figure 62

This disassembly procedure is tedious and time consuming. Due to the potential for injury and damage any shortcuts should be avoided. A spring compression tool drawing and instructions are included on page 93. It is recommended the compression tool be used to disassemble and reassemble the brake. **IMPORTANT!!** If the brake spring compression tool is not going to be used, the following procedure must be followed to avoid personal injury and component damage.

CAUTION: The brake cover is under 72,000 psi (pounds/square inch) of pressure created by the brake apply springs.

It is recommended that the capscrew heads be numbered to assist in following the loosening/ tightening sequence. Refer to ***figure 63***. In a crossing or star pattern loosen the (24) brake cover capscrews turning no more than one quarter (1/4) turn at a time in sequence. Continue this process until all pressure on the cover has been relieved.

Figure 63
After all spring force has been relieved from cover remove the (24) cover screws and washers.

Figure 64
Install (2) eye bolts to assist in handling the brake cover in opposite warning plate holes.

Figure 65
Remove brake cover.

Discs, Pressure Ring and Spring Removal

Figure 66
Remove brake friction and reaction discs. **NOTE:** If discs are to be reused they need to be reinstalled in the exact order and direction in which they were removed.

Figure 67
Remove brake piston pressure ring.

Figure 68
Remove brake springs. **NOTE:** Inner and outer springs are matched sets and must remain together. As each set is removed it is recommended that they be wired together to prevent mixing sets.

Figure 69
Remove brake cover seal ring.

Wear Indicator Pin Removal

Figure 70
Tap out brake wear indicator pin.

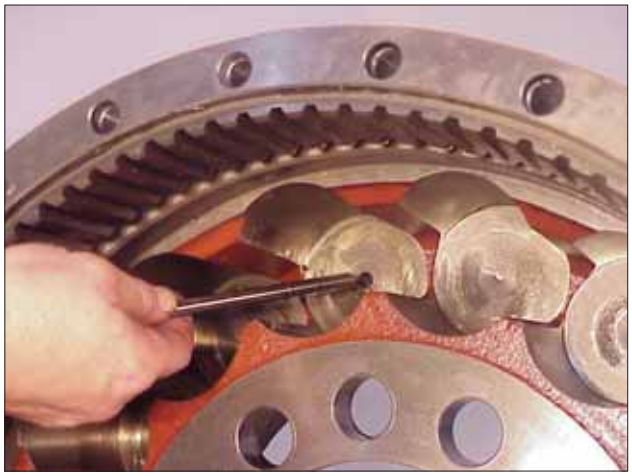


Figure 71
Remove brake wear indicator pin.

Piston Removal

Figure 72
Place brake cover on flat surface face down. Install (3) screws and flat washers in the brake piston puller holes.
CAUTION: Brake cover is heavy and can cause injury and damage.

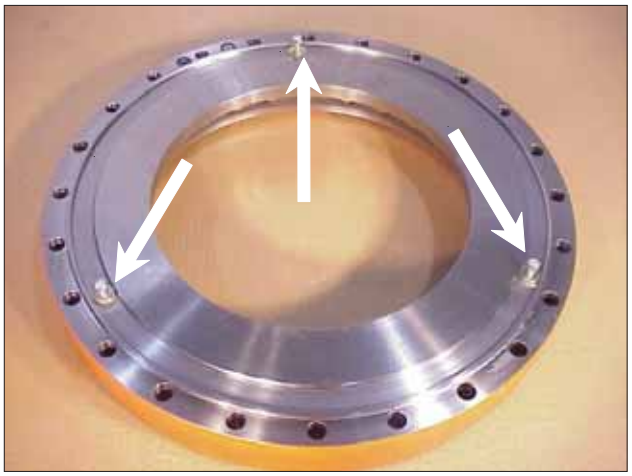


Figure 73
Piston with puller screws and washers installed.

Figure 74
Using a pry bar, evenly pry piston out of the brake cover until it is no longer in contact with the piston seals.

Figure 75
Piston pulled out of seals.
Piston can be removed by hand at this point.

Figure 78
Remove inner piston seal assembly.

Figure 76
Remove brake piston.

Figure 79
Remove (2) pressure port sealing rings.

Figure 77
Remove outer piston seal assembly.

Figure 80
Remove pressure ring seal ring.

Figure 81
Remove (2) brake wear indicator pin o-rings.

Figure 82
Remove brake wear indicator pin retaining ring.
NOTE: Not necessary to remove
unless replacement is required.

Clean and inspect all components.
Repair or replace components as required.

Differential and Carrier Disassembly
Input Flange Removal

Figure 83
Remove input flange nut cotter pin.

Figure 84
Remove input flange nut and washer.

Figure 85
Remove input flange.

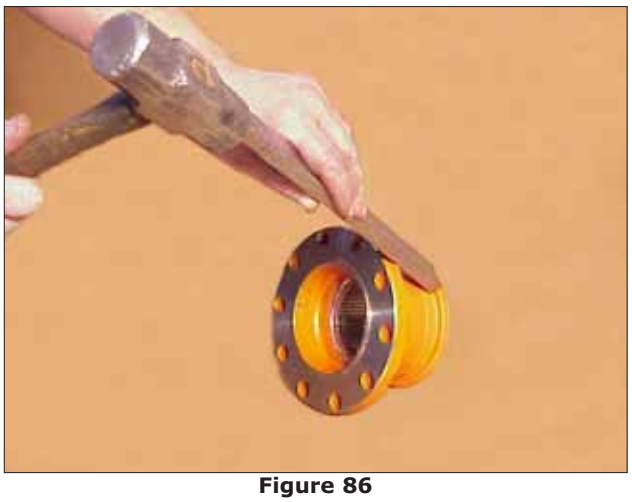


Figure 86
Remove input flange dust shield.
NOTE: Remove only if replacement is required.

Figure 87
Loosen thrust screw lock nut.

Figure 88
Remove thrust screw.

Differential and Ring Gear Removal

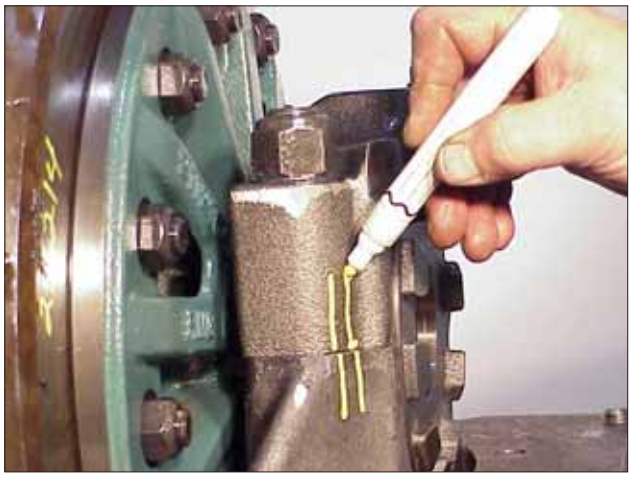


Figure 89
Mark carrier and caps to identify for reassembly.

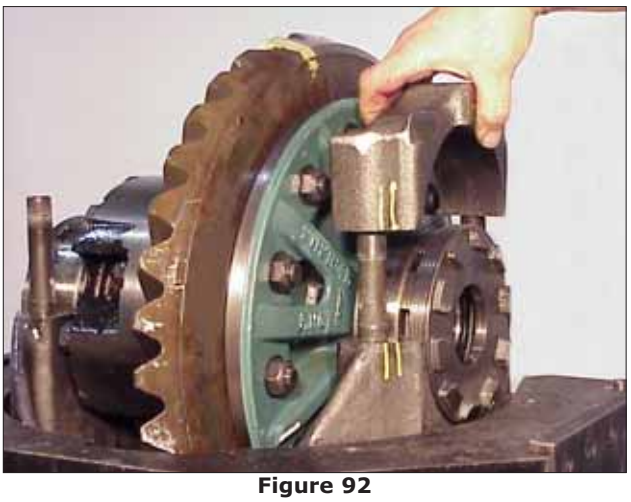


Figure 92
Remove carrier caps.

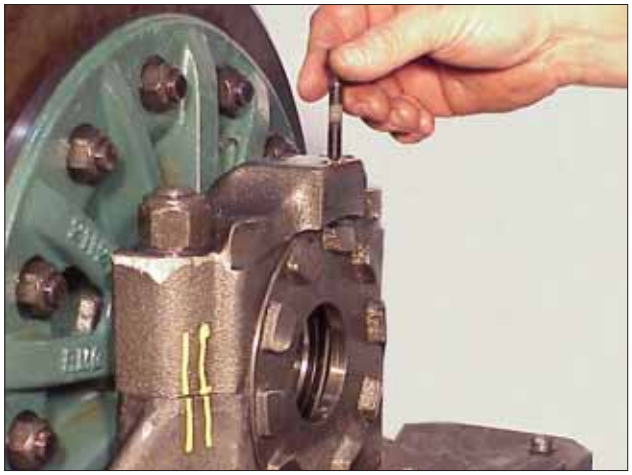


Figure 90
Remove (2) differential adjusting nut lock screws and lock washers.

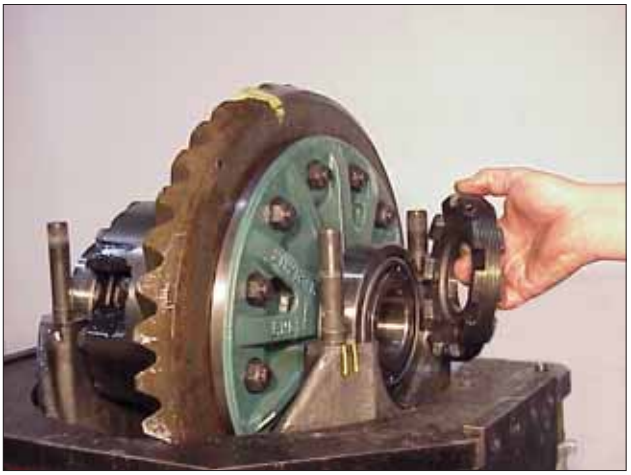


Figure 93
Remove differential adjusting nuts.

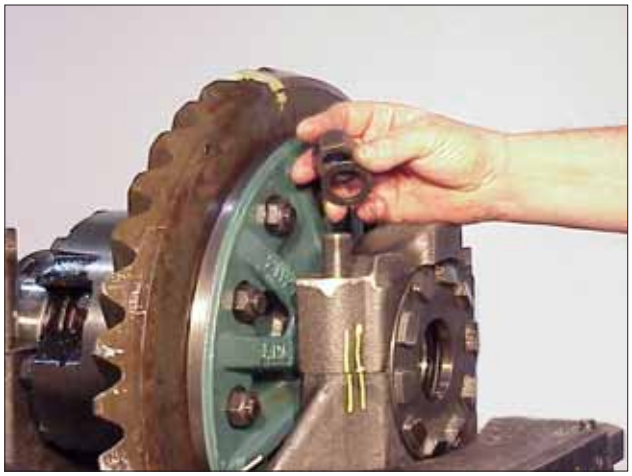


Figure 91
Remove (4) carrier cap nuts and washers.

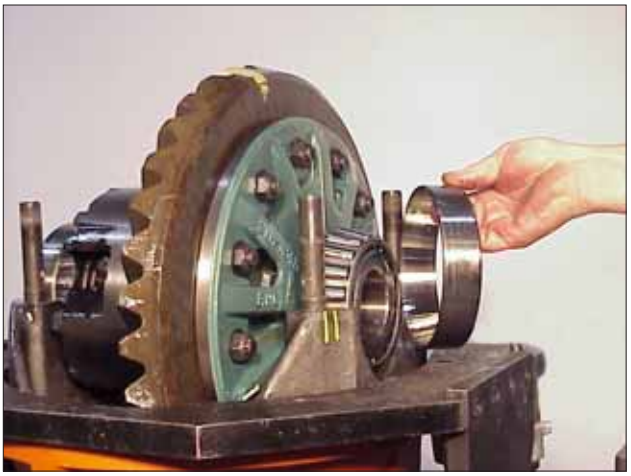


Figure 94
Remove bearing cups.

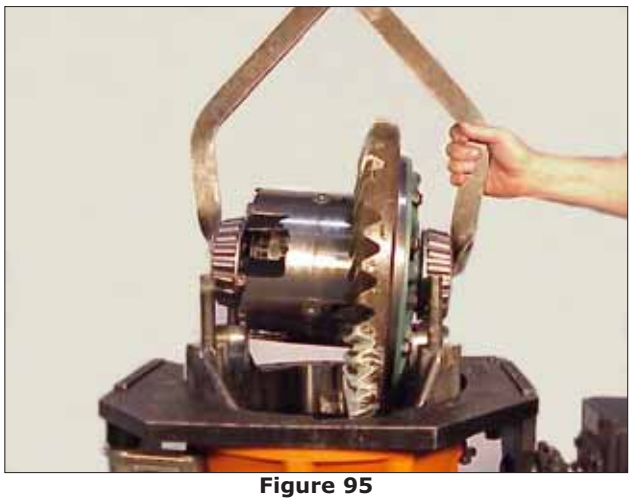


Figure 95
Remove differential assembly.

Figure 98
Remove cover.

Input & Drop Gear Shaft Removal

Figure 96
Remove (11) carrier cover screws and lock washers.

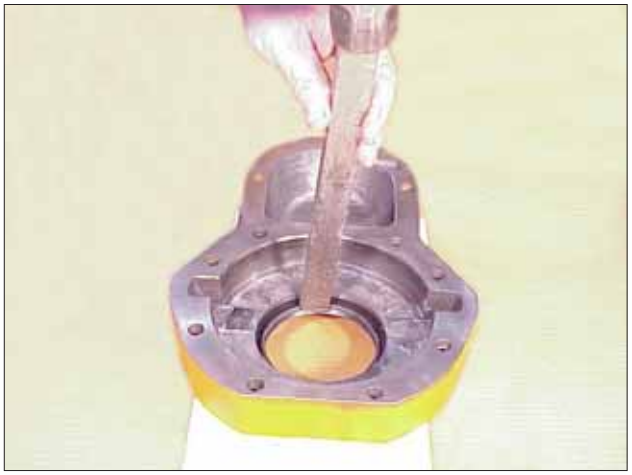


Figure 99
Remove input shaft oil seal from carrier cover.

Figure 97
Carefully pry carrier cover from carrier housing.

Figure 100
Remove (8) input shaft outer bearing retainer screws and lock washers.

Figure 101
Carefully pry outer bearing retainer from carrier.

Figure 102
Remove outer bearing retainer and shims.

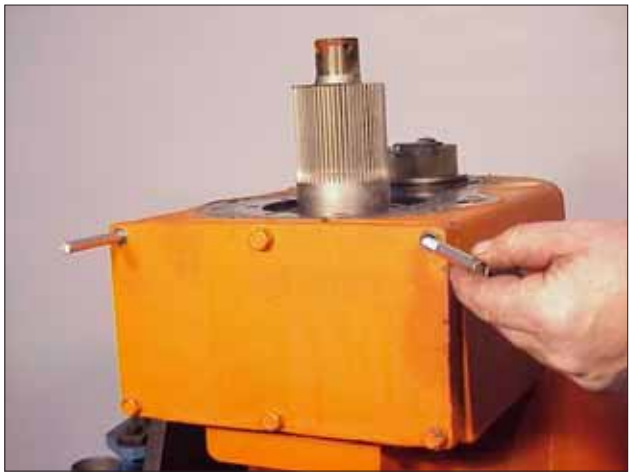


Figure 103
Remove (2) top corner drop gear access cover screws and install alignment pins. **NOTE:** Alignment pins can be made by removing heads from bolts.

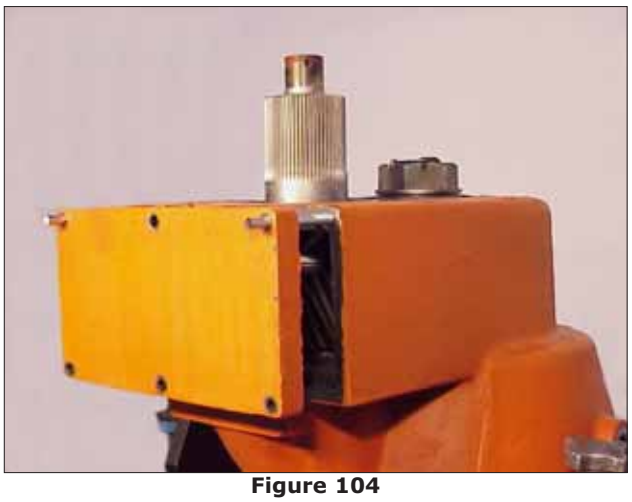


Figure 104
Remove remaining (5) drop gear access cover screws, lock washers and cover.

Figure 105
Reinstall input flange nut to protect threads from damage.

Figure 106
Tap end of input and drop gear shaft to release pressure on the bearing retaining snap ring.

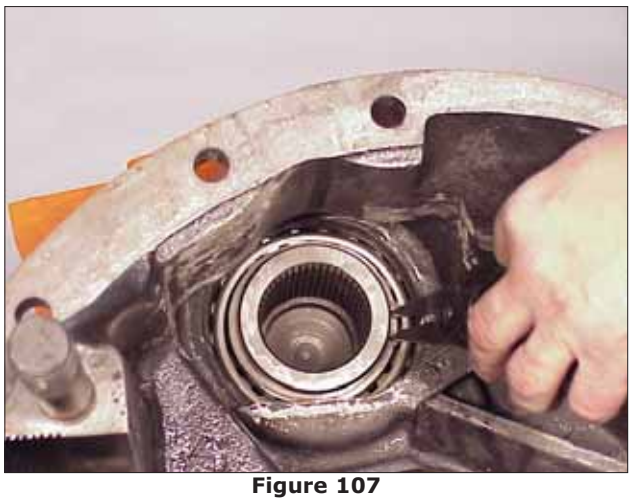


Figure 107
Remove bearing retaining snap ring.
NOTE: Input and drop gear shaft not as shown.

Figure 108
Drive input and drop gear shaft out of inner bearing cone. The outer input shaft bearing cup will also be pushed out of the carrier during this procedure.
NOTE: Input and drop gear shaft not as shown.

Figure 109
Remove input and drop gear shaft.
NOTE: Input and drop gear shaft not as shown.

Figure 110
Remove input and drop gear shaft outer bearing cone.
NOTE: Input and drop gear shaft not as shown.

Figure 111
Remove input drop gear, bearing and snap ring washer.

Pinion and Drop Gear Removal

Figure 112
Remove pinion nut cotter pin.

Figure 113
Remove pinion nut and washer.

Figure 116
Remove outer pinion bearing cone and spacer.

Figure 114
Install pinion removal tool as shown.
Refer to tool drawing on page 101.
OPTIONAL: Reinstall pinion nut to protect threads and carefully drive pinion out of bearing.

Figure 117
Remove pinion.

Figure 115
Press pinion out of outer pinion bearing cone.

Figure 118
Remove inner pinion bearing cone.

Figure 119
Remove pinion drop gear.

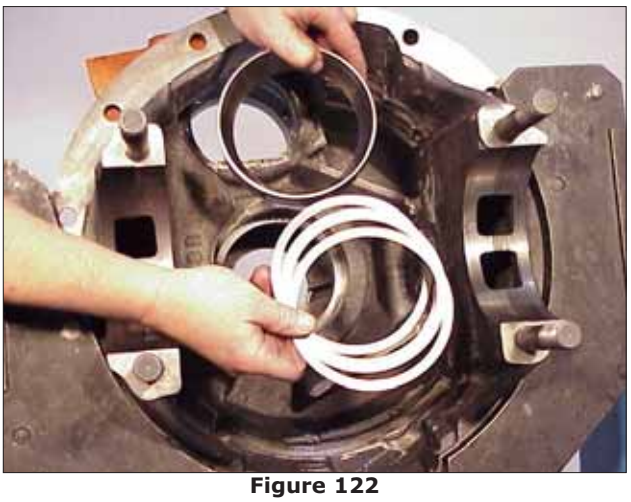


Figure 122
Inner pinion bearing cup removed with shims.

Figure 120
Remove outer pinion bearing cup.

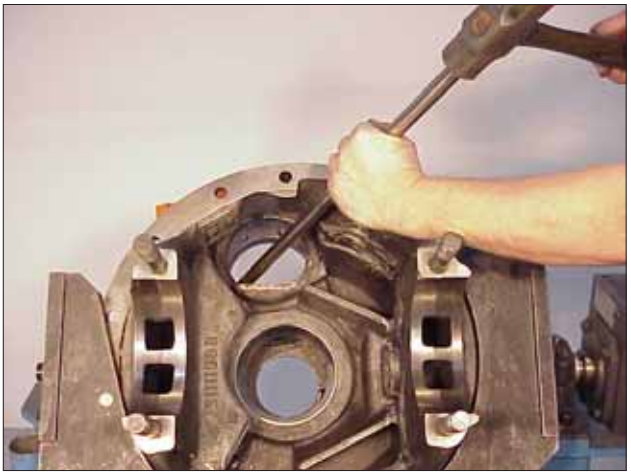


Figure 123
Remove inner input and drop gear shaft bearing cup.

Ring Gear Removal

Figure 121
Remove inner pinion bearing cup.

Figure 124
Remove (12) ring gear nuts.

Figure 125
Remove (12) ring gear screws using a punch as shown. **NOTE:** Use energy absorbing material, like the wood blocks shown, to protect the ring gear teeth. The ring gear should fall onto this material after a number of the screws are removed. If it does not, tap gear with a soft mallet.

Figure 126
Ring gear after dropping onto protective wood blocks.

Differential Disassembly

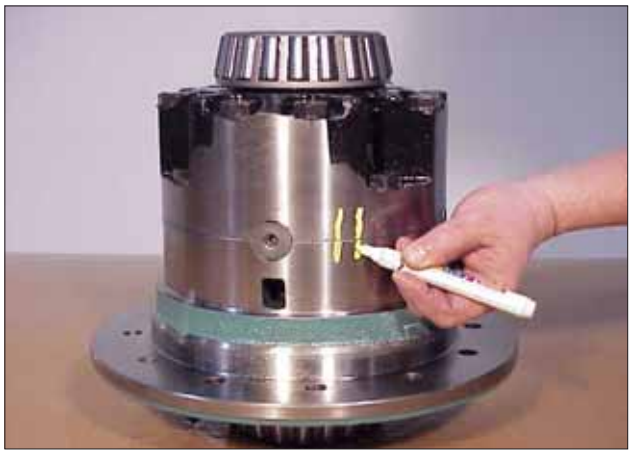


Figure 127
Mark differential case halves to identify for reassembly.

Figure 128
OPTIONAL: To facilitate removal of differential body screws apply heat to release thread locking compound. Be careful not to overheat or discolor unit.

Figure 129
Remove (12) differential body screws and washers.

Figure 130
Separate differential halves.

Figure 131
Remove inner and outer differential clutch discs.

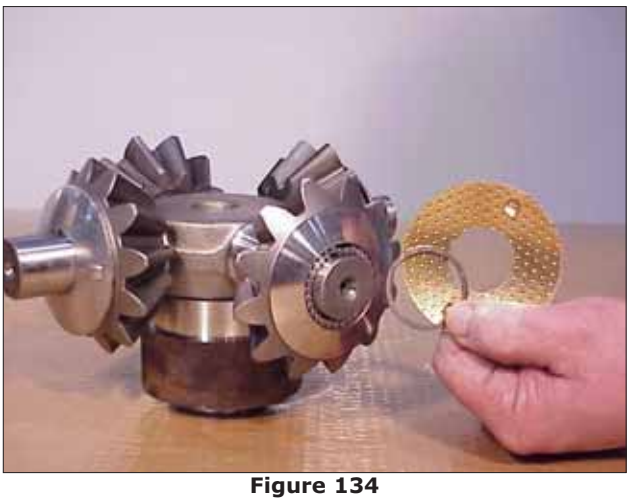


Figure 134
Remove differential pinion thrust washers and outer bearing spacers.

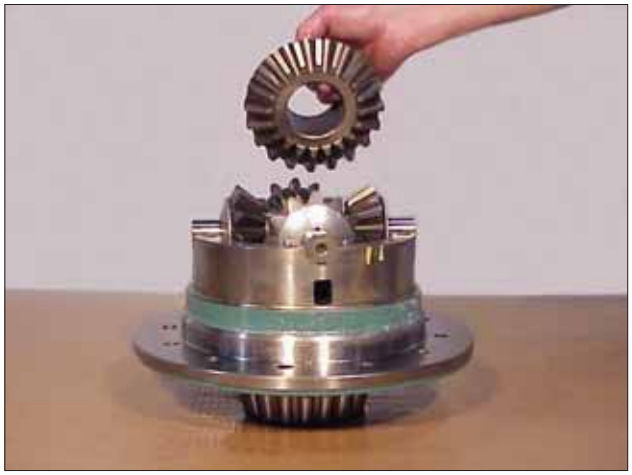


Figure 132
Remove side gear.

Figure 135
Remove differential pinion gears, needle rollers, inner and center bearing spacers.

Figure 133
Remove differential spider, pinion gear assemblies and thrust washers.

Figure 136
Remove side gear from differential body flanged half.

Figure 137
Remove inner and outer differential clutch discs from differential body flanged half.

Figure 138
OPTIONAL: Apply heat to facilitate removal of plain half bearing cone.

Figure 139
Remove plain half bearing cone. Repeat steps in ***figures 138 & 139*** to remove flanged half bearing cone.

Clean and inspect all components.
Repair or replace components as required.

REASSEMBLY

Planetary Reassembly

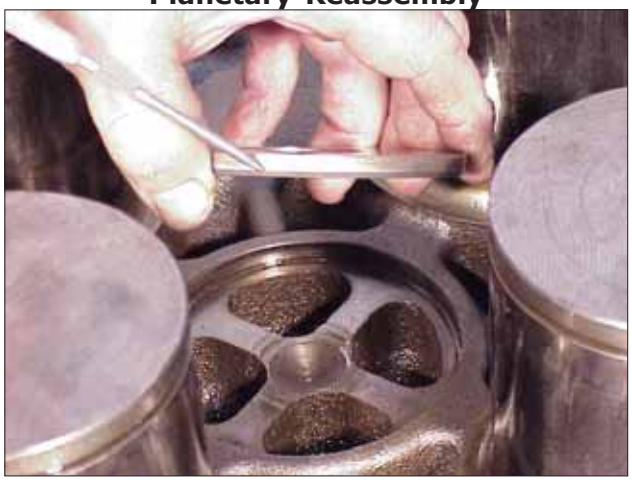


Figure 140
Locate thrust washer chamfer as shown.

Figure 143
Heat gear and bearing assembly to aid assembly. Install with the bearing radius down. Refer to bearing heating and freezing guidelines on page 14.

Figure 141
Using appropriate driver, install washer in planet carrier.

Figure 144
Install retaining ring.

Figure 142
Identify large radius on bearing race as shown. Gear and bearing assembly must be assembled with radius facing towards planet carrier.

Figure 145
Repeat steps in ***figures 142-144*** for remaining (3) assemblies.

Hub Reassembly

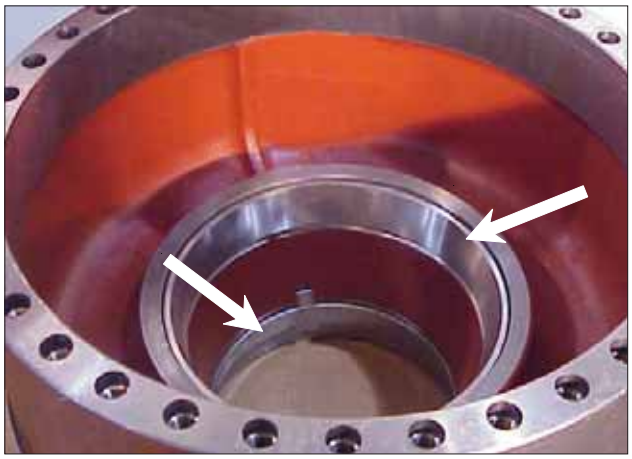


Figure 146
Install inner and outer bearing cups. Tips for installing cups can be found in bearing heating and freezing guidelines on page 14.

Figure 147
Using a .002" feeler gage check that bearing cups are seated against the shoulder. When cup is seated, feeler gage should not fit between cup and hub shoulder. Check in several locations.

Figure 148
Lubricate bearing cup with axle lubricant.

Figure 149
Lubricate inner cone with axle lubricant and install.

Figure 150
Apply continuous coat of Loctite 262 or equivalent to outside diameter of hub seal. Insure entire surface is covered.
CAUTION: Do not over apply.

Figure 151
Use seal driver to install seal.
Refer to tool drawing on page 102.

Internal Ring Gear and Hub Assembly and Installation

Refer to exploded view and parts description on pages 5 and 6 for this procedure.

Figure 152
Install internal gear hub (Item 27)
in internal ring gear (Item 26).
Install internal ring gear snap ring (Item 28).
.

Figure 153
Heat inner bearing cone and install on internal gear hub.
Refer to bearing heating and freezing guidelines on page 14.
NOTE: Internal ring gear and hub assembly not as shown.

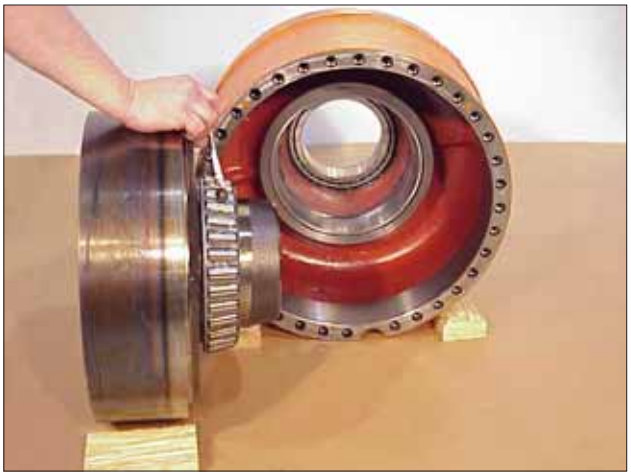


Figure 154
Lubricate inner bearing cone with axle lubricant.
NOTE: Internal ring gear and hub assembly not as shown.

Figure 155
Install internal ring gear in hub.
NOTE: Internal ring gear and hub assembly not as shown.

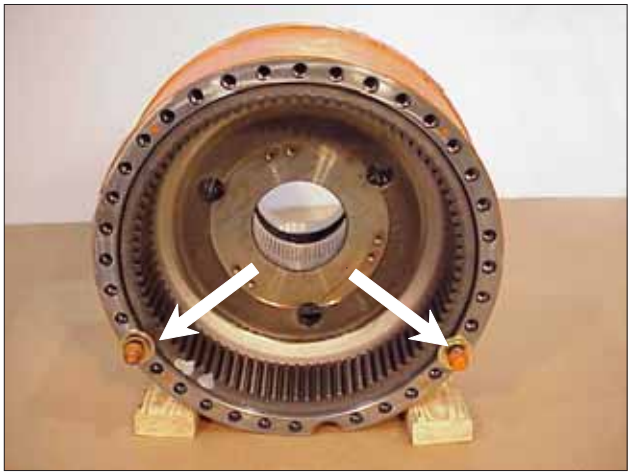


Figure 156
Install (2) screws with large flat washers as shown.
Lightly tighten screws until washers contact hub.

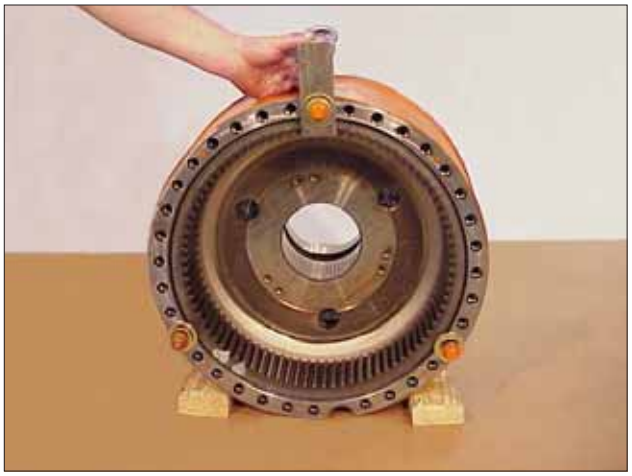


Figure 157
Install lifting device.
Refer to tool drawing on page 99.

Posi-Stop Brake Reassembly

Figure 158
Clean cured thread locking compound from holes with a .625-11 UNRC-2A tap. Use compressed air to remove residue from holes. Use appropriate eye protection when using compressed air.

Figure 159
Position brake housing on blocks as shown to allow clearance for the wear indicator pin. Pin will protrude through bottom of housing.

Wear Indicator Pin Installation

Figure 160
Install wear indicator pin retaining ring.

Figure 161
Install (2) wear indicator pin o-rings and lubricate.

Figure 162
Install wear indicator pin in housing.

Pressure Ring and Spring Installation

Figure 163
Lubricate pressure ring o-ring sealing surface with grease.

Figure 164
Install brake spring sets.

Figure 165
Lubricate brake cover seal ring with grease and install.

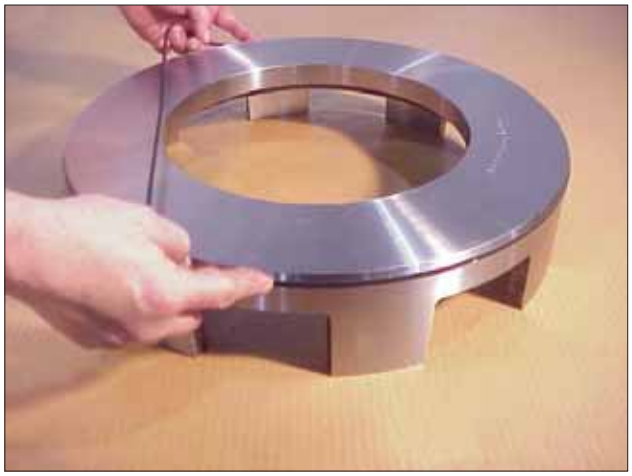


Figure 166
Lubricate seal ring with grease and install on pressure ring.

Figure 167
Set pressure ring into position. A lifting device similar to the one shown can ease installation.
Refer to tool drawing on page 98.

Brake Disc Installation

Figure 168
Install reaction disc.

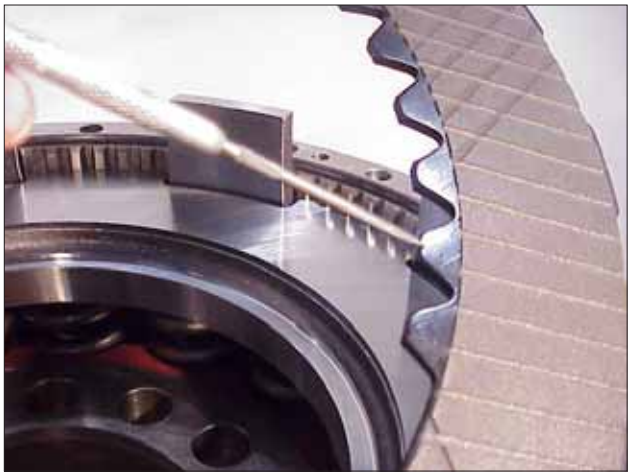


Figure 169
Identify the rounded edges on teeth of friction discs. Rounded edges should be installed facing "UP".

Figure 170
Install friction disc. Alternately install the remaining reaction and friction discs. **NOTE:** Align the friction disc oil grooves (missing teeth) with the previously installed friction disc. Alignment of friction disc teeth at this time will ease spline engagement during hub installation.

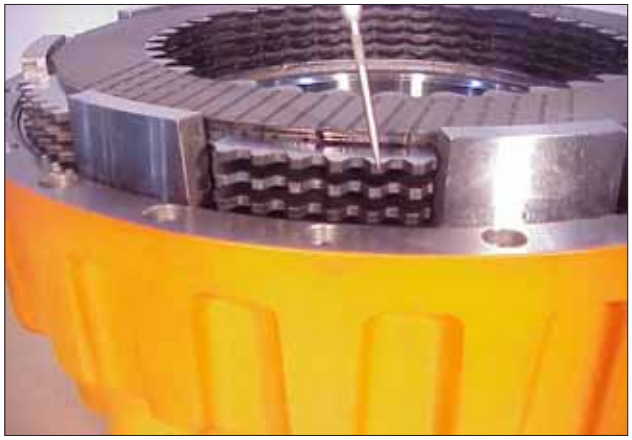


Figure 171
Line up the reaction disc teeth with the internal teeth in brake housing.

Figure 172
Install (2) alignment pins in brake housing 180° apart. **NOTE:** Alignment pins can be made by using bolts with heads cut off.

Piston Installation

Figure 173
Install outer piston seal assembly.

Figure 174
Install inner piston seal assembly. **NOTE:** Use caution not to over stretch the inner o-ring and seal ring.

Figure 175
Lightly lubricate inner and outer piston seals and piston with grease, install piston in brake cover.

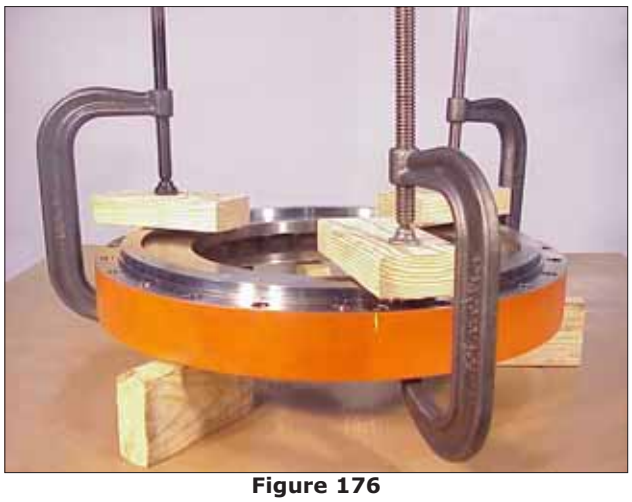


Figure 176
Evenly press piston into brake cover until it bottoms out. "C" clamps can be used, as shown, to ease this process.

Cover Installation

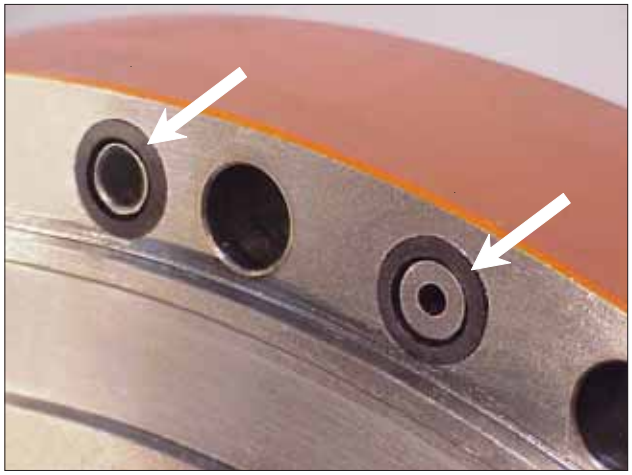


Figure 177
Install (2) pressure port seal rings. **NOTE:** Use grease to retain seal rings in grooves during handling and assembly.

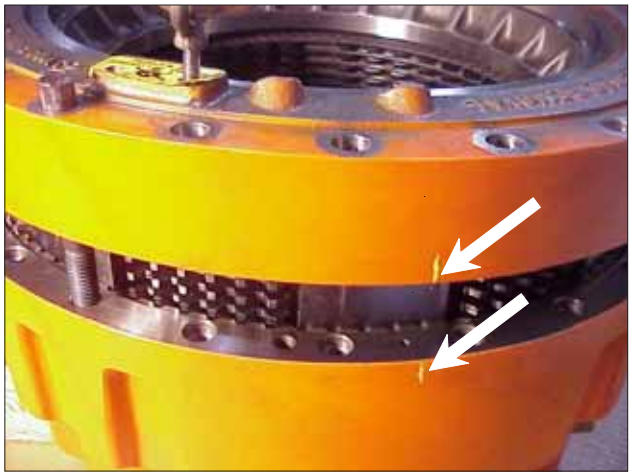


Figure 178
Mark location of pressure ports on brake cover and housing. Align ports and install cover on alignment pins.

Figure 179
Remove (2) alignment pins and install (24) brake cover screws and washers.
NOTE: Run screws down only "Finger Tight".

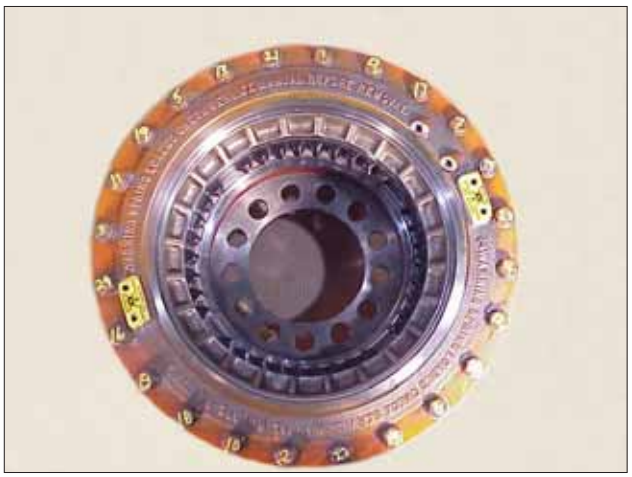


Figure 180
Mark screws with numbers from 1-24 in a criss crossing pattern.

Figure 181
Carefully recheck alignment of reaction disc teeth and teeth in the brake housing.
IMPORTANT: This is a critical step. If the teeth are not properly aligned they will not enter the brake housing without damage as the springs are compressed.

Figure 182
Tighten the (24) brake outlet cover screws in a criss crossing pattern by turning each screw ***NO MORE THAN 1/4 TURN.*** As springs are compressed check alignment of reaction disc teeth as they enter the brake housing. When cover contacts brake housing the screws should be tightened to 175-190 LBF/FT [240-260 Nm].

Figure 183
Install (2) pressure port plugs.
Tighten to 84-120 LBF/IN [10-14 Nm].

Figure 184
Air pressure test.
Refer to pressure test instructions on page 21.

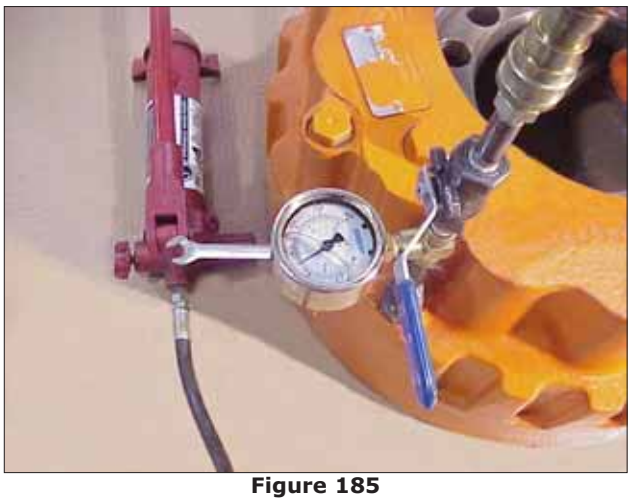


Figure 185
Hydraulic pressure test brake.
Refer to pressure test instructions on page 21.

Figure 186
One at a time remove the (24) brake cover screws. Apply Loctite 262 or equivalent to the threads, reinstall and tighten to 175-190 LBF/FT [240-260 Nm].
IMPORTANT: Do not remove more than one screw at a time.

Figure 187
Install (2) warning sticker covers with (4) screws and tighten to 215-240 LBF/IN [24-27 Nm].

Differential and Carrier Reassembly

Figure 188
Using appropriate driver install pinion shaft outer bearing cup.

Figure 189
Using appropriate driver install input shaft inner bearing cup.

Calculating and Installing Pinion Shims

Figure 190
Install the original or same thickness inner pinion bearing cup shim pack if reinstalling the original ring and pinion set. If installing a new ring and pinion set compare the etched numbers on the ring gears and adjust the shim pack accordingly. The total length of the etched number and shim thickness of new ring and pinion should be the same as the old ring and pinion number and shim pack. Refer to detailed depth setting procedure on page 18.

Figure 191
Using appropriate driver install pinion shaft inner bearing cup.

Figure 192
Using a .002" feeler gage check to be sure inner and outer bearing cups are seated in bores. When cups are properly seated the feeler gage should not fit between the cups or shims and carrier housing shoulder. Check several locations around the cup diameter. Refer to bearing heating and freezing guidelines on page 14.

Figure 193
Lubricate inner pinion bearing cup with axle lubricant.

Figure 194
Position pinion drop gear in housing aligning hole in gear with bore in housing.

Pinion Gear Installation and Preload

Figure 195
Heat and install pinion shaft inner bearing cone. Refer to bearing heating and freezing guidelines on page 14.

Figure 196
Install original pinion shaft inner bearing spacer if ring and pinion or drop gear was not replaced. See service parts list for spacer and shim kit to be used with new ring and pinion and/or drop gear. Follow the instructions supplied with the kit for proper usage and assembly of spacer and shim kit.

Figure 197
Install pinion in housing and drop gear.

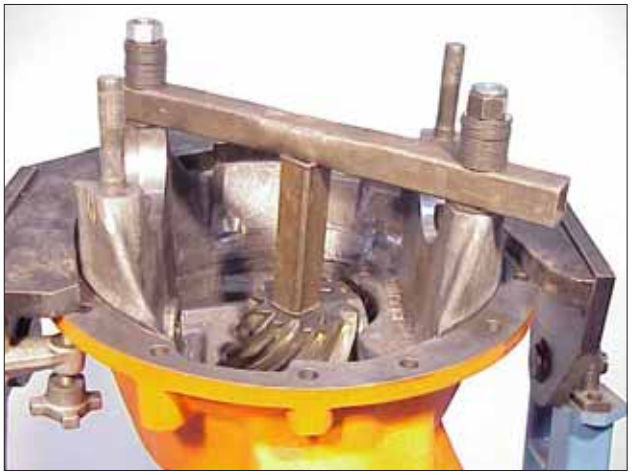


Figure 198
Secure pinion in position with a holding device similar to one shown.

Figure 199
Install original pinion shaft outer bearing spacer if ring and pinion or drop gear was not replaced. See service parts list for spacer and shim kit to be used with new ring and pinion and/or drop gear. Follow the instructions supplied with the kit for proper usage and assembly of spacer and shim kit.

Figure 200
Lubricate outer pinion bearing cup with axle lubricant.

Figure 201
Using appropriate driver, or by heating, install pinion shaft outer bearing cone.

Figure 202
Install pinion nut and washer.

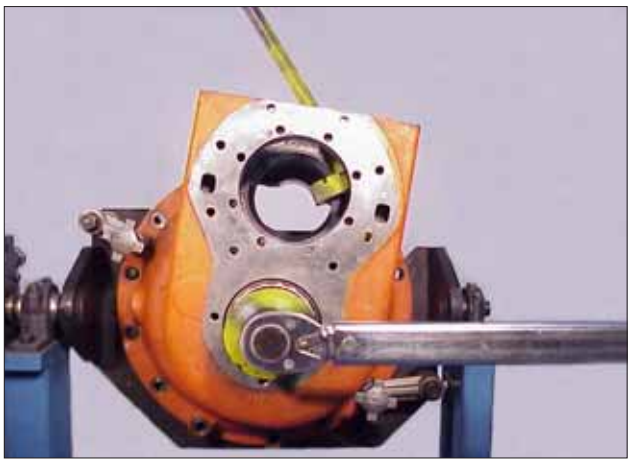


Figure 203
Tighten pinion nut to *525-560 LBF/FT [712-759 Nm]. Use pinion locking tool shown in ***figure 204*** or equivalent to hold pinion from turning. ***NOTE:** If original bearing spacer has been replaced with the pinion bearing spacer and shim kit, apply Loctite 262 or equivalent to the pinion nut threads and tighten to 700-750 LBF/FT [950-1017 Nm].

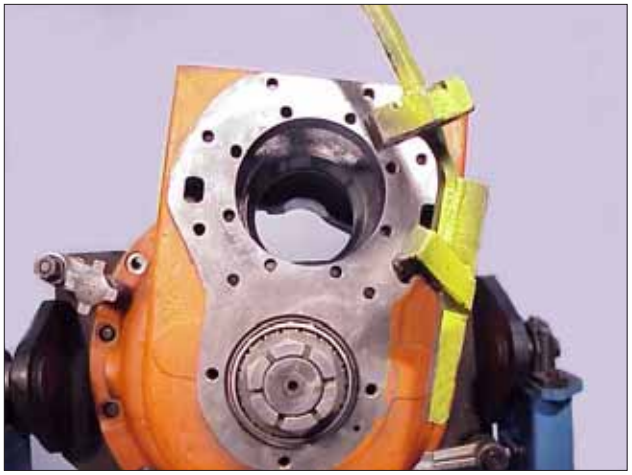


Figure 204
Pinion locking tool. Refer to tool drawing on page 100.

Figure 205
Tap end of pinion several times with a soft mallet to seat bearings.

Figure 206
Tap carrier housing several times with a soft mallet to seat bearings. Refer to ***figure 203*** and recheck pinion bearing nut torque.

Figure 207
Remove pinion holding device.

Figure 208
Check pinion bearing preload with a dial torque wrench. Reading should be 5-30 LBF/IN [.6-3.4 Nm]. If reading is not within specification the original bearing spacer will need to be replaced with a pinion bearing spacer and shim kit. If the spacer and shim kit has already been installed adjustments to the shim pack are required. See service parts list for spacer and shim kit identification. Follow instructions supplied with the kit for proper usage and assembly. Repeat disassembly steps in ***figures 113-117*** and reassembly steps in ***figures 196-208***.

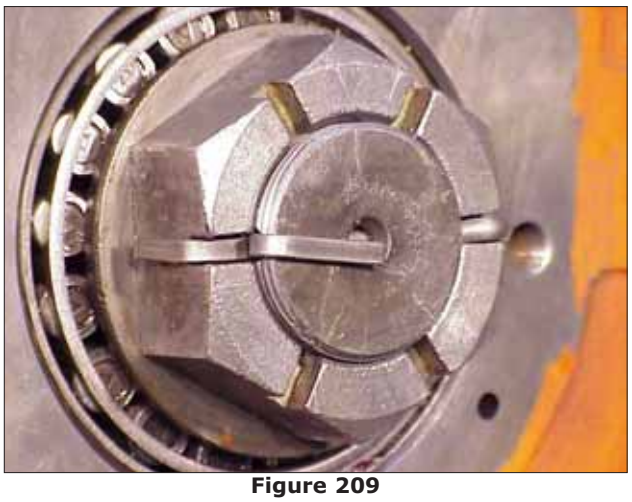


Figure 209
Install pinion nut cotter pin and bend ends as shown.

Input and Drop Gear Shaft Installation

Figure 210
Heat input shaft inner bearing cone and place into inner bearing cup in housing. **IMPORTANT:** Immediately proceed to steps in ***figures 211 & 212*** before bearing cools.

Figure 211
Heat and position input shaft drop gear in housing. **IMPORTANT:** Immediately proceed to step in ***figure 212*** before drop gear and bearing cool.

Figure 212
Install input shaft into drop gear and inner bearing cone.

Figure 213
Install input shaft snap ring washer.

Figure 214
Install input shaft bearing retaining snap ring.

Figure 215
Drive input and drop gear shaft forward to remove all end clearance between snap ring, snap ring washer, bearing cone and to insure that bearing cup is seated in bore. **NOTE:** Be sure to protect end of shaft and threads from being damaged.

IMPORTANT:
This is a very critical procedure. If all end clearance is not removed the bearing preload will be lost after machine is in operation.

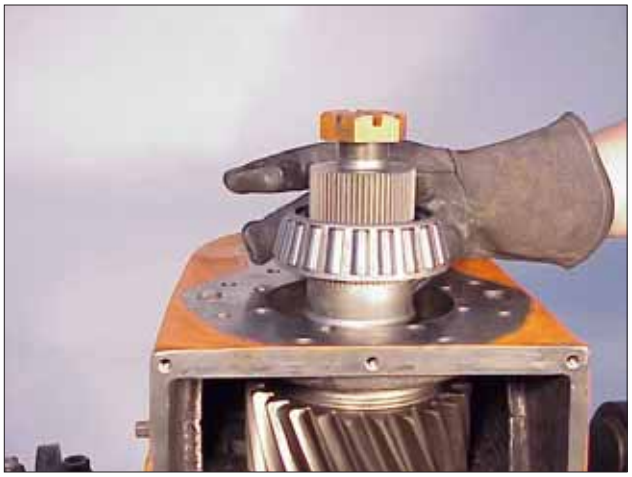


Figure 216
Heat input shaft outer bearing cone and install.

Figure 217
Position input outer bearing cup over shaft.

Figure 220
Position bearing retainer shims on alignment pin. **NOTE:** It is a good practice to start out with the same or same thickness shim pack that was removed.

Figure 218
Using appropriate driver install input shaft outer bearing cup.

Figure 221
Position bearing retainer on alignment pin.

Figure 219
Install (1) alignment pin in bolt circle around input shaft bearing. **NOTE:** Alignment pin can be made by removing the head from a bolt.

Figure 222
Install (4) input bearing retainer screws and lock washers in every other hole and tighten to 65-40 LBF/FT [88-95 Nm].

Setting Input and Drop Gear Shaft End Play

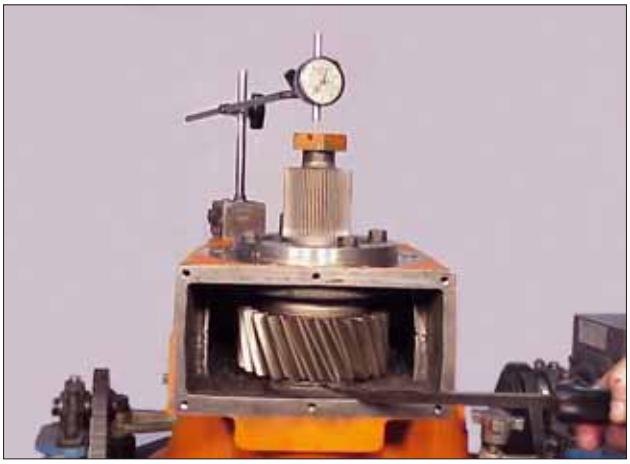


Figure 223

STEP 1 Using a dial indicator and pry bar as shown, pry between bottom of drop gear and housing to measure input shaft end play and record value. If no end play exists add shims to obtain approximately .004-.006" [.102-.152mm] end play.

STEP 2 Using a dial type torque wrench measure the no-load rolling torque of the input shaft assembly and record value.

STEP 3 Calculate shim pack thickness by subtracting the amount of recorded end play from step 1 less an additional .002" [0.050mm] from the total shim pack thickness.

EXAMPLE:	0.080 "	[2.032mm]	- Initial Shim Pack Thickness
	-0.004 "	-[0.100mm]	- End Clearance From Step 1
	-0.002 "	-[0.050mm]	- Bearing Preload
	0.074 "	[1.882mm]	- Desired Shim Pack Thickness

STEP 4 Remove input bearing retainer screws, bearing retainer and shims. Install desired shim pack as determined in step 3 and reinstall bearing retainer. ***Reference figures 220-222.***

STEP 5 Using a dial type torque wrench measure the rolling torque of the input shaft assembly and record value.

STEP 6 Subtract value in step 2 from value in step 5. The correct result should be 27-41 LBF/IN [3-5Nm]. If the result is not within this range repeat steps 4-6 adding or subtracting .002" [0.050mm] thickness shims until the desired rolling torque is obtained.

EXAMPLE:	47 LBF/IN	[5.3Nm]	- Value from step 5
	-17 LBF/IN	-[1.9Nm]	- No-load value from step 2
	30 LBF/IN	[3.4Nm]	- Must be within 27-41 LBF/IN [3-5Nm]

Figure 224
Remove (4) retainer screws and lock washers. Apply Loctite 262 or equivalent to (8) input shaft bearing retainer screws, assemble with lock washers and tighten to 65-70 LBF/FT [88-95 Nm]. Remove input flange nut.

Differential Body Assembly

Figure 225
Clean cured thread locking compound from differential plain half screw holes with a .625-11 UNC-3B tap and clean holes of any remaining residue.

Figure 226
Heat and install bearing cones on differential body halves.

Figure 227
Install (4) differential outer clutch discs into differential flanged half.

Figure 228
Install (3) differential inner clutch discs onto side gear.

Figure 229
Install side gear with clutch discs into differential body flanged half.

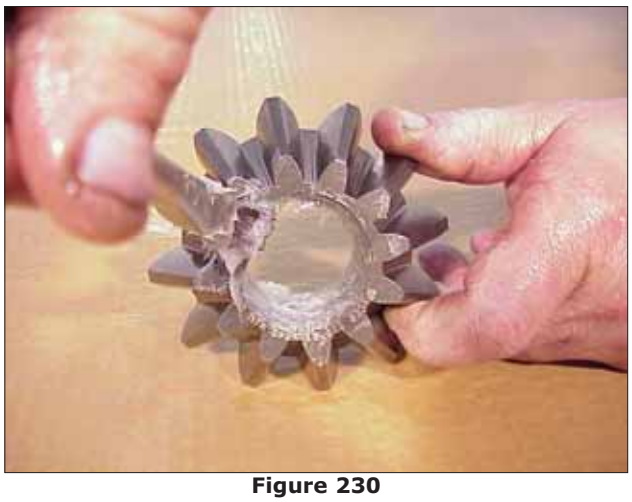


Figure 230
Apply a heavy coat of grease or petroleum jelly to the inside diameter of differential pinion gear. The grease is used to hold needle rollers in position in following steps.

Figure 231
Load (29) needle rollers into one end of differential pinion gear bore.

Figure 232
Install center bearing spacer.

Figure 233
Load second row of (29) needle rollers.

Figure 234
Install inner and outer bearing spacers and install gear onto spider. **NOTE**: See ***figure 235*** for proper spacer usage and positioning.

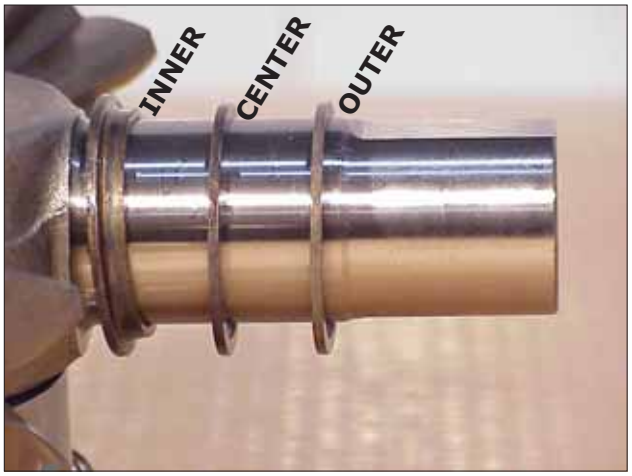


Figure 235
Proper bearing spacer usage and positioning.

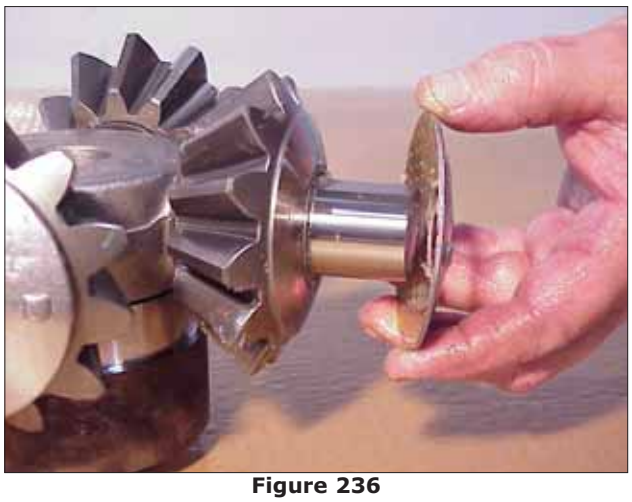


Figure 236
Lubricate and install differential thrust washer. Repeat steps in ***figures 230-236*** for remaining (3) differential pinion gears.

Figure 237
Lubricate differential side gear with axle lubricant.

Figure 238
Set the differential spider with gears in the differential body bores and side gear teeth.

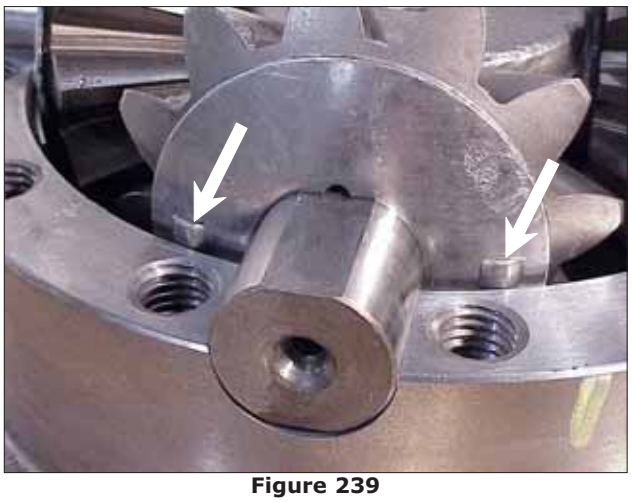


Figure 239
Align tangs on (4) pinion thrust washers with counter bore in differential body as shown.

Figure 240
Lubricate pinion gear teeth with axle lubricant.

Figure 241
Set side gear onto differential pinion gears.

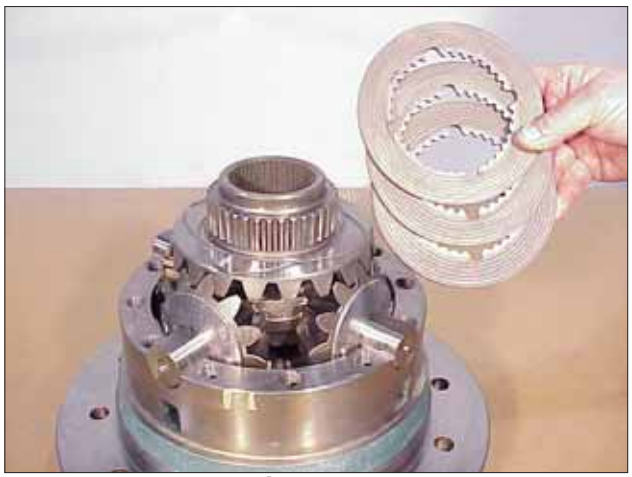


Figure 242
Install (3) inner clutch discs on side gear.

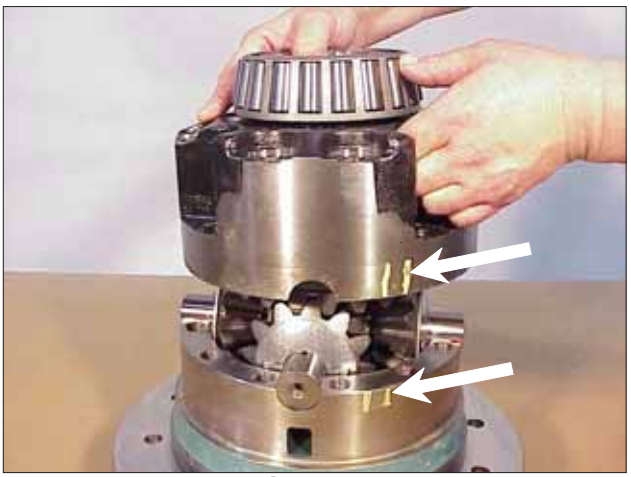


Figure 245
Place the differential body plain half on the flanged half. **IMPORTANT:** Line up the identification marks made during disassembly.

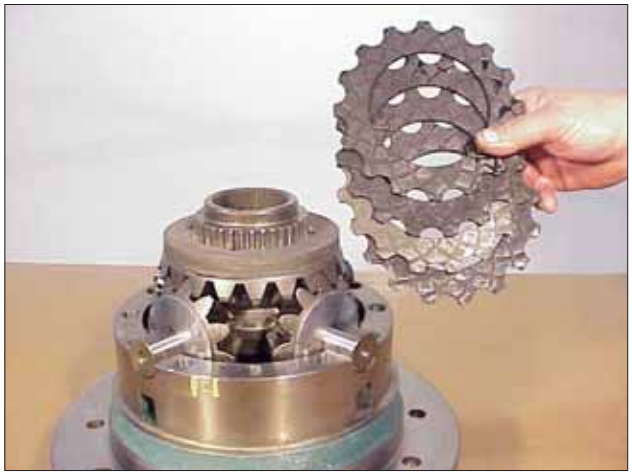


Figure 243
Install (4) outer clutch discs on side gear aligning outer tangs of discs with each other.

Figure 246
Apply Loctite 262 or equivalent to (12) differential body screws and install with washers.

Figure 244
Proper clutch disc stack up and alignment.

Figure 247
Tighten differential body screws to 175-190 LBF/FT [237-258 Nm].

Ring Gear Installation

Figure 248
Use a hone stone or file to remove nicks or burrs from ring gear mounting face. **NOTE:** Be sure to remove all abrasive residue.

Figure 249
Use a hone stone or file to remove nicks or burrs from ring gear mounting face. **NOTE:** Be sure to remove all abrasive residue.

Figure 250
Place ring gear on differential flanged half.

Figure 251
Align holes in ring gear with holes in differential body flange. Insert (12) ring gear mounting screws.

Figure 252
Tap (12) ring gear mounting screws into fully seated position. **IMPORTANT:** Correct alignment of screw heads shown in ***figure 253.***

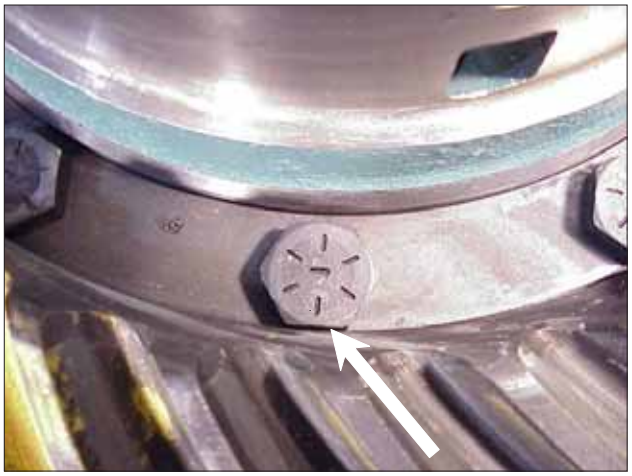


Figure 253
Proper alignment of ring gear mounting screw heads with inside diameter of ring gear counter bore.

Figure 254
Apply Loctite 262 or equivalent to ring gear mounting screws.

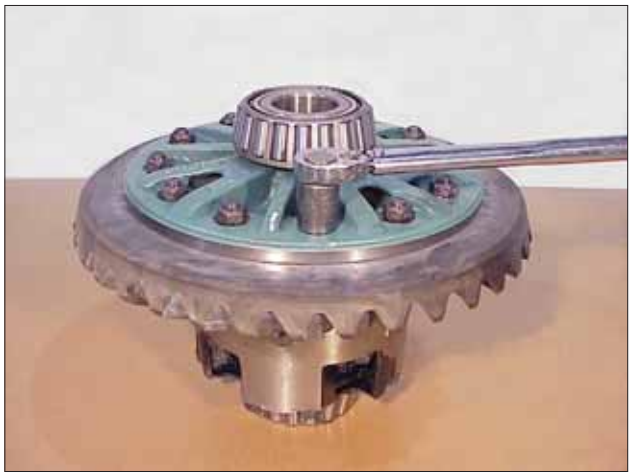


Figure 255
Install (12) ring gear mounting screw nuts and tighten to 175-190 LBF/FT [240-260 Nm].

Differential Body and Ring Gear Installation

Figure 256
Set differential assembly into carrier.

Figure 257
Lubricate (2) differential bearing cones with axle lubricant.

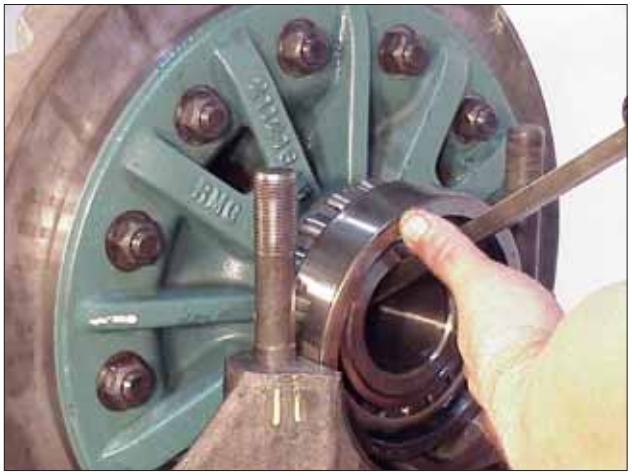


Figure 258
Install (2) differential bearing cups.

Figure 259
Install (2) differential adjusting nuts.

Figure 260
Tighten both adjusting nuts to take up all clearance in the differential bearings. Rock ring gear back and forth during this process to check for backlash.

Carrier Cap Installation

Figure 261
Install both carrier caps.
Line up identification marks made during disassembly.

Figure 262
Install (4) carrier cap nuts and washers.
Tighten only enough to seat caps at this time.

Setting Ring Gear Backlash

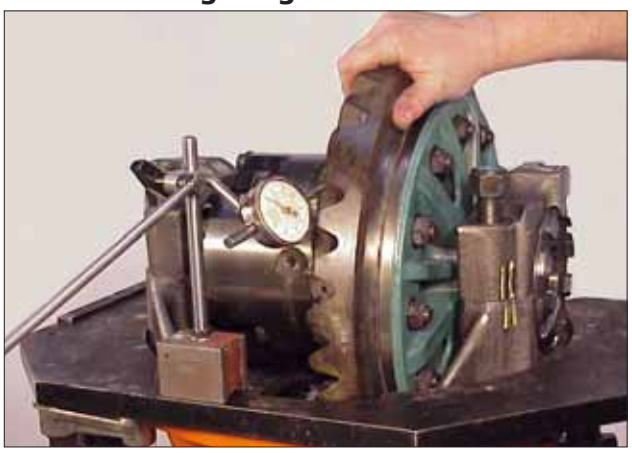


Figure 263
Using a dial indicator as shown check ring gear and pinion backlash. Backlash specification is .010-.015 [.250-.380 mm]. Adjustment is made by loosening adjusting nut on one side and tightening opposite nut a corresponding amount until the correct backlash is achieved. After obtaining correct backlash recheck tightness of adjusting nuts to assure that all clearance has been removed from differential bearings.

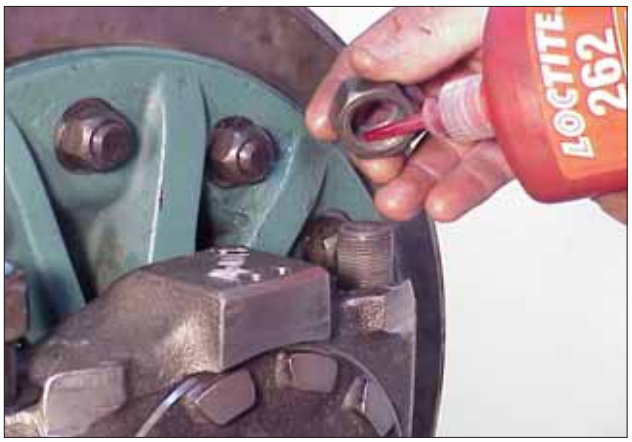


Figure 264
Remove (4) cap nuts, apply Loctite 262 or equivalent and reinstall.

Figure 265
Tighten cap nuts to 475-525 LBF/FT [645-710 Nm].

Figure 266
Apply Loctite 262 or equivalent to
(2) differential adjusting nut lock screws.

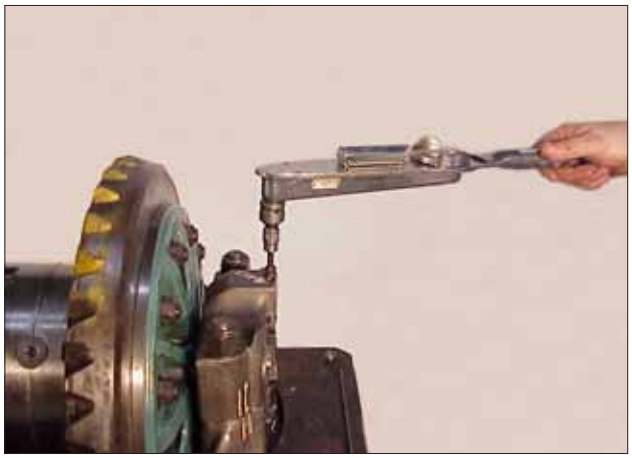


Figure 267
Install (2) differential adjusting nut lock screws and washers. Tighten to 15-18 LBF/FT [20-24 Nm].
NOTE: Select the screw hole that does not cause the screw to interfere with the adjusting nut lugs.

Drop Gear Cover Installation

Figure 268
Apply a continuous .06 [1.5 mm] diameter bead of RTV sealant to drop gear access cover mounting surface.

Figure 269
Install (2) alignment pins in top corner holes.

Figure 270
Install access cover on alignment pins. Apply Loctite 262 or equivalent to (6) cover screws and install with lock washers. Remove (2) alignment pins and install remaining screws and lock washers.

Figure 271
Tighten cover screws to 25-28 LBF/FT [34-38 Nm].

Input Flange Spacer Installation

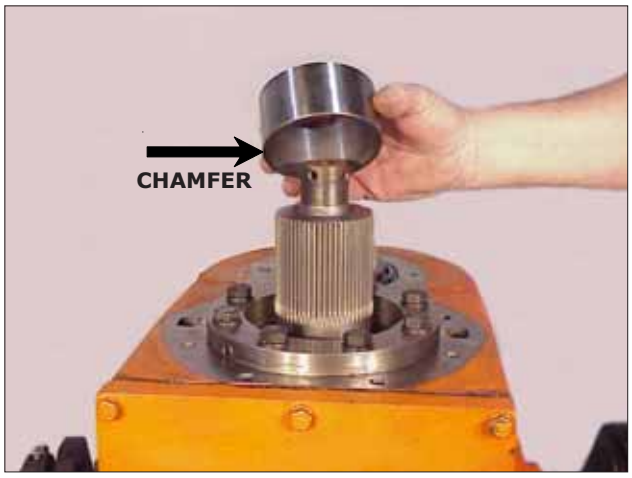


Figure 272
Install input flange Spacer.
NOTE: Assemble with chamfer towards bearing cone.

Carrier Cover Installation

Figure 273
Apply a continuous .06 [1.5 mm] diameter bead of RTV sealant to carrier cover mounting surface.

Figure 274
Using appropriate driver install input seal in carrier cover.
NOTE: Position seal with the dust lip facing out.

Figure 275
With the aid of an alignment pin, install carrier cover.

Figure 276
Apply Loctite 262 or equivalent to carrier cover screws.

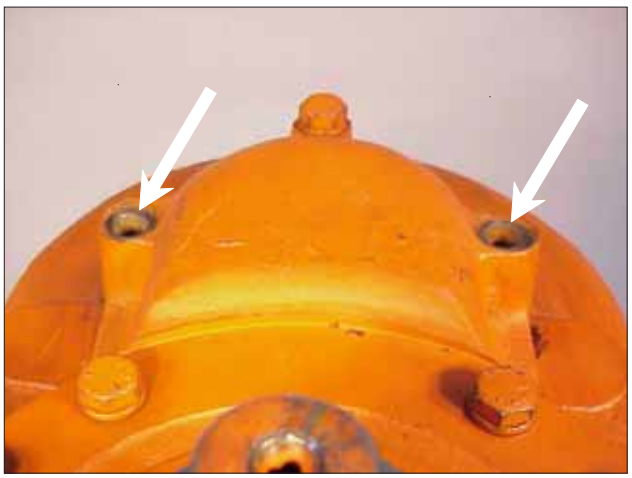


Figure 277
Install (9) carrier cover screws with lock washers.
NOTE: Do not install cover screws at this time in the two hole shown above if using a chain to install differential assembly. Reattach chain as shown in axle disassembly ***figure 42.***

Figure 278
Tighten cover screws to 65-70 LBF/FT [88-95 Nm].

Input Flange Installation

Figure 279
Pack input shaft oil seal with grease and apply heavy coat to outer lip.

Figure 280
If replacement is required install input flange dust shield using appropriate driver.

Figure 281
Install input flange.
NOTES: The flange splines are an interference fit which require that the flange be heated or driven on shaft. When heat is not used pack dust shield cavity with grease.

Figure 282
Apply bead of RTV sealant as shown centered over joint between shaft splines and flange splines.

Figure 283
Install input shaft nut and washer.

Figure 284
Tighten input flange nut to
525-560 LBF/FT [712-759 Nm].

Checking Ring Gear Contact Pattern

Figure 285
Paint (6) to (8) ring gear teeth with gear contact checking compound as shown.

While turning input shaft initiate a load on the differential body and ring gear with a length of 2x4 wedged between the differential body and carrier housing.

Rotate input so the pinion gear teeth make several passes through the checking compound in each direction.

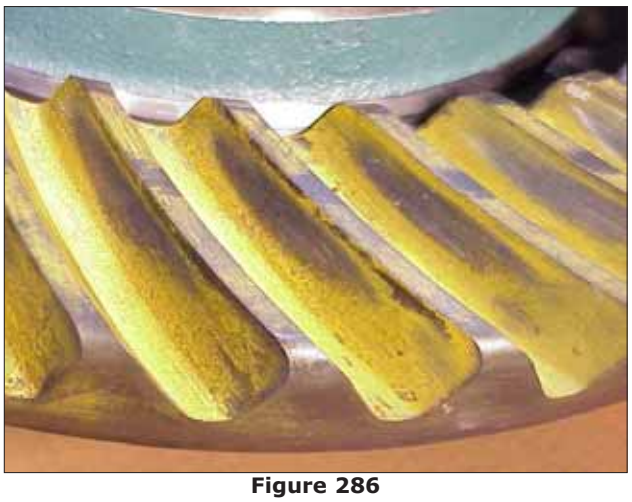


Figure 286
Compare ring gear convex tooth pattern with right hand gear tooth contact chart on page 24. Follow instructions on chart to correct pattern problems.

Figure 287
Compare ring gear concave tooth pattern with right hand gear tooth contact chart on page 24. Follow instructions on chart to correct pattern problems.

Figure 288
Install input flange nut cotter pin and bend ends as shown.

Thrust Screw Installation

Figure 289
Apply teflon thread sealer to thrust screw.

Figure 290
Install thrust screw and nut.
Tighten screw until it contacts ring gear.

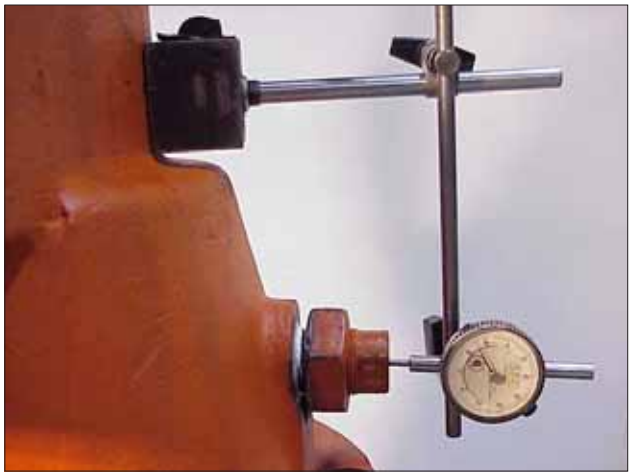


Figure 291
Using a dial indicator as shown back out thrust screw .010-.015 [.25-.38 mm] from contact with ring gear.

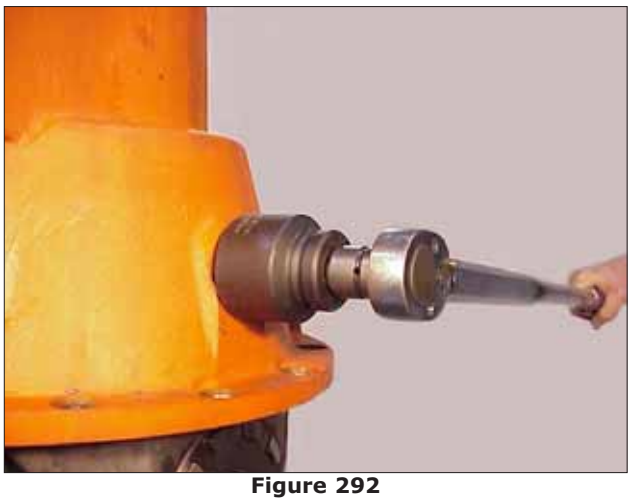


Figure 292
Tighten thrust screw lock nut to 350 LBF/FT [475 Nm].
NOTE: Observe position of thrust screw flats before torquing to be sure screw did not turn with nut.

Spindle and Brake Installation

Figure 293
Apply grease to spindle housing seal ring and install.

Figure 294
Apply grease to spindle pilot seal ring and install.

Figure 295
Clean taped holes with solvent and compressed air.
IMPORTANT:
Do not clean/chase threads using a tap.
Apply grease to spindle pilot bore in axle housing.

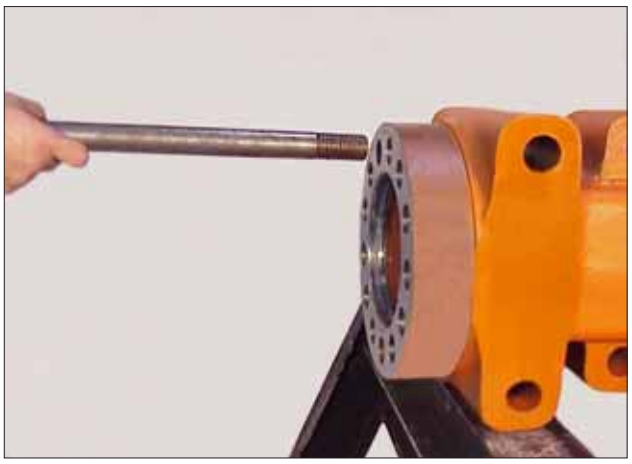


Figure 296
Install alignment pin in upper spindle screw hole. **NOTE:** Threaded end of pin must engage threads in axle housing a minimum of 1.5 times pin diameter or 2.0 [50.8 mm].

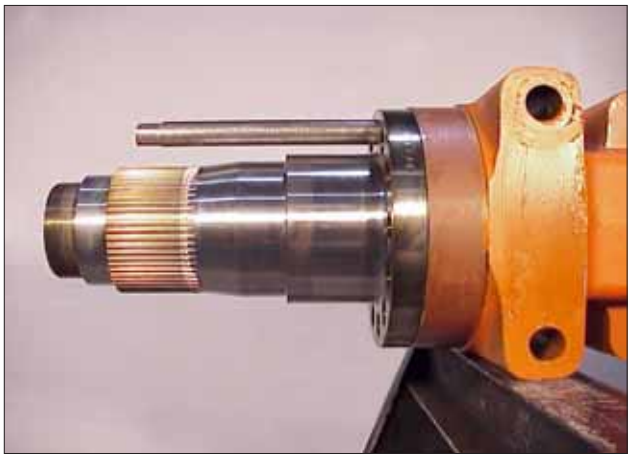


Figure 297
Install Spindle. **NOTE:** Spindle pilot needs to be fully engaged in axle housing. A soft mallet may be necessary to drive spindle into position.

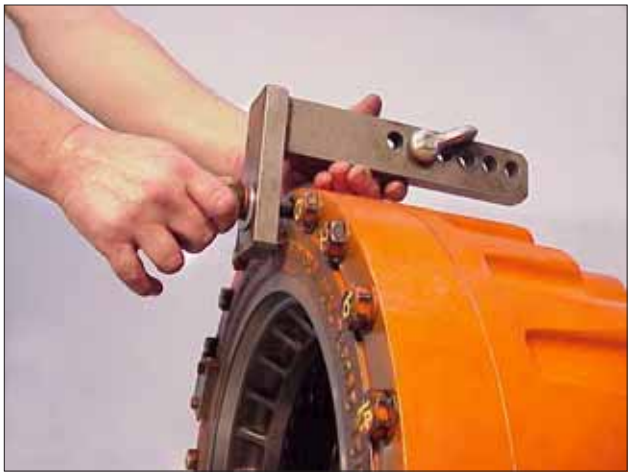


Figure 298
Remove top screw from brake and install lifting device.
Refer to tool drawing on page 99.

Figure 299
Apply grease to brake seal ring and install.

Figure 300
Carefully install brake assembly.

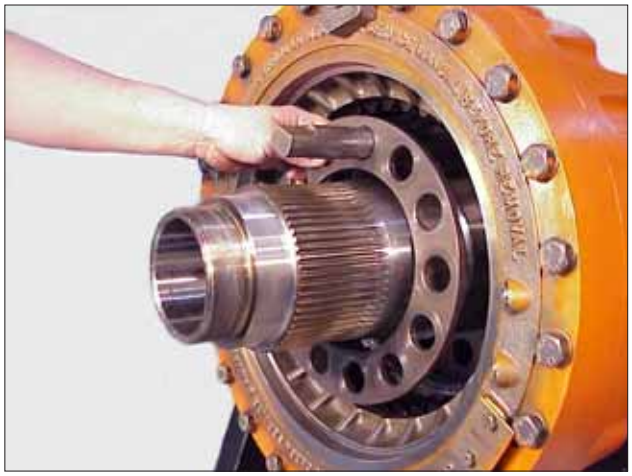


Figure 301
Install spindle retaining ring.

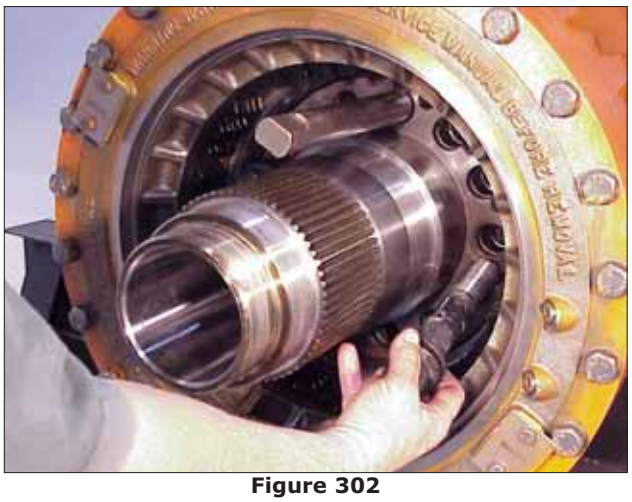


Figure 302
Install (12) spindle screws and washers.
IMPORTANT:
New screws are highly recommended for each rebuild.
Housing and screw threads must be clean and dry.
DO NOT use Loctite or lubricant.

Figure 303
Tighten (12) spindle screws to
approximately 100 LBF/FT [136 Nm].

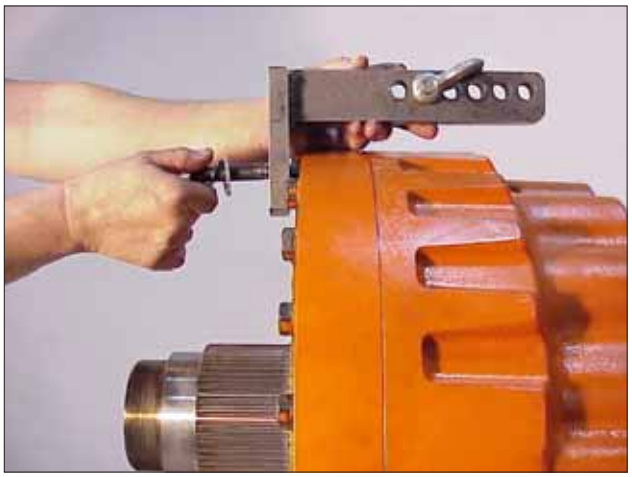


Figure 304
Remove lifting device from brake.

Figure 305
Apply Loctite 262 or equivalent to brake cover screw.

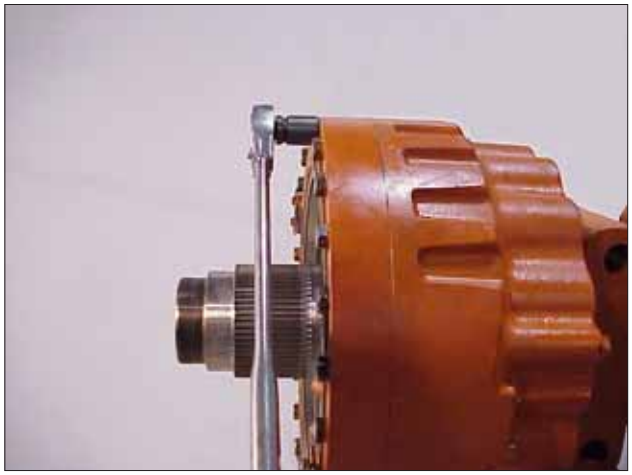


Figure 306
Install brake cover screw and washer.
Tighten to 175-190 LBF/FT [240-260 Nm].

Figure 307
Remove alignment pin. Install (1) spindle screw and washer. Tighten to approximately 100 LBF/FT [136 Nm]. Reference ***Figures 302 & 303.***

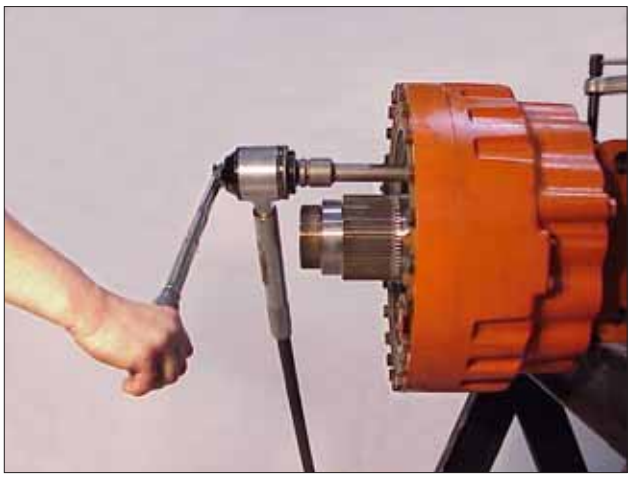


Figure 308
Tighten (13) spindle screws to
1850-2000 LBF/FT [2508-2712 Nm] in a circular pattern.

Hub Installation

Figure 309
Install lifting device on hub.

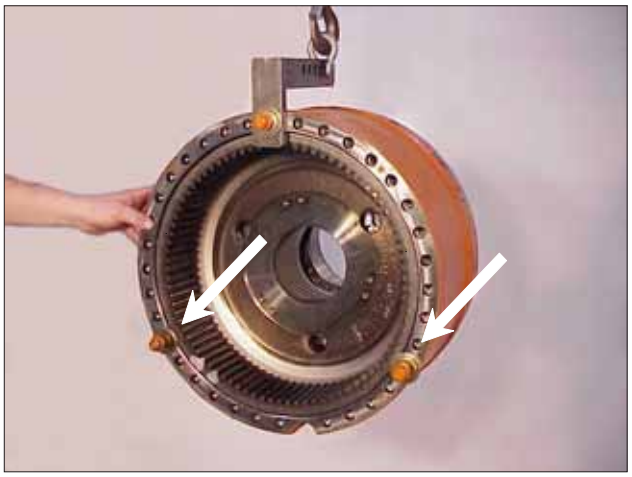


Figure 310
Screws and flat washers installed during hub reassembly should be in place as indicated above. If not they should be installed to hold internal gear in hub during handling.

Face Seal Installation

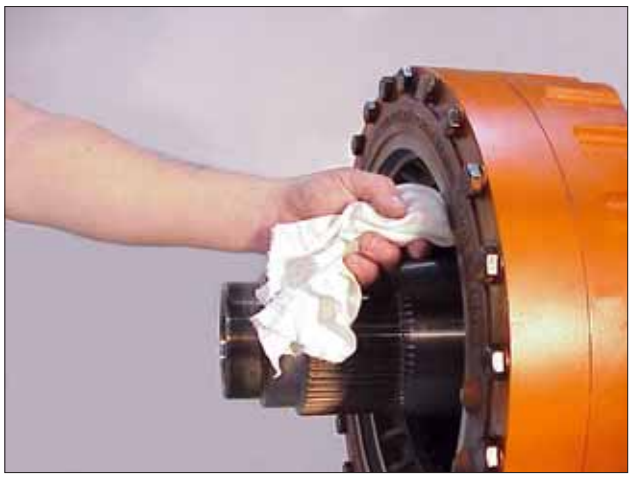


Figure 311
Clean face seal bore in brake housing with solvent.
NOTE: Refer to face seal installation procedure on page 20 for detailed instructions.

Figure 312
Clean face seal bore in wheel hub with solvent.

Figure 313
Install face seal and toric ring into installation tool. Reference Caterpillar tool part number 8T7789-2.

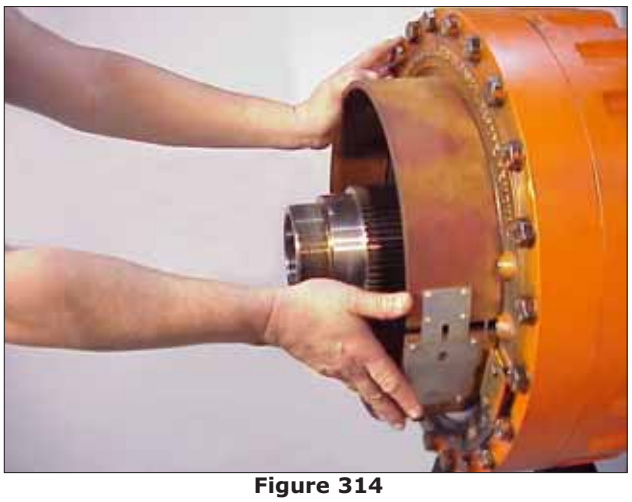


Figure 314
Carefully press face seal into brake housing.
NOTE: Use sudden and even pressure against tool to push the toric ring into the housing.

Figure 315
Carefully press 2nd half of face seal into wheel hub.
NOTE: Use sudden and even pressure against tool to push the toric ring into the hub.

Figure 316
Install hydraulic source to brake actuating port and pressurize to 1500 PSI [10342 kPa] to release brake.

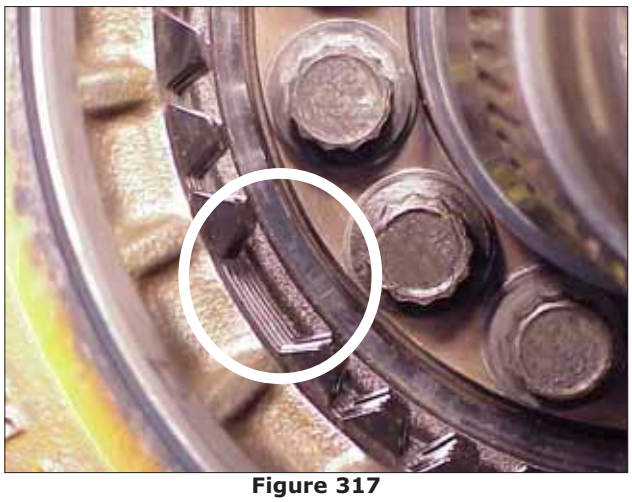


Figure 317
Align brake friction discs so that the missing teeth (wide space) on all discs line up with each other.

Figure 320
Lubricate inner diameter of hub seal with oil.

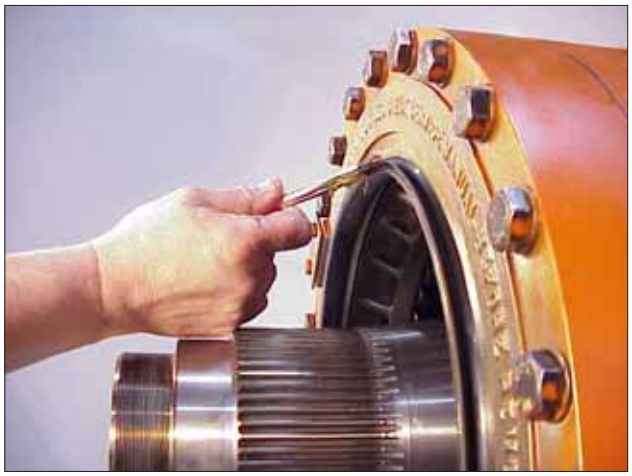


Figure 318
Apply oil to face seal contact surface.

Figure 321
Apply Anti-Seize or Never-Seez lubricant to spindle splines. **NOTE:** Refer to wheel bearing adjusting procedure on page 19 for detailed instructions.

Figure 319
Apply oil to face seal contact surface.

Figure 322
Apply Anti-Seize or Never-Seez lubricant to face of spindle nut.

Figure 323
Apply Anti-Seize or Never-Seez lubricant to spindle threads.

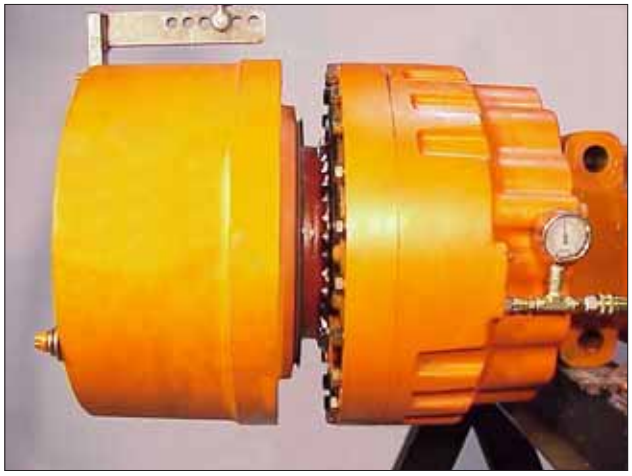


Figure 324
Install hub assembly. It will be necessary to rotate wheel hub slightly to engage brake disc teeth. Do not force as damage to disc teeth could occur.

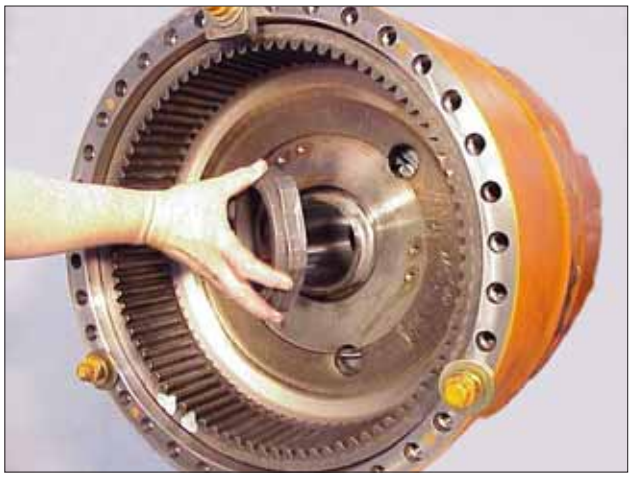


Figure 325
Install spindle nut. After nut is secure on spindle remove lifting device and the screws and flat washers used for handling.

Wheel Bearing Preload Adjustment

Refer to wheel bearing adjusting procedure on page 19 for detailed instructions.

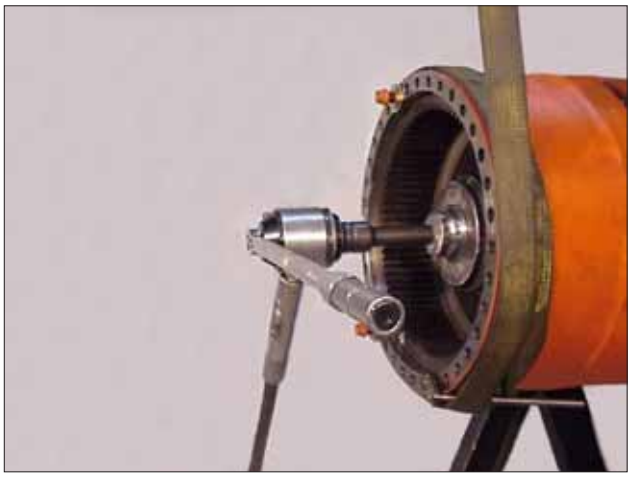


Figure 326
Tighten spindle nut to 1200 LBF/FT [1627 Nm] while rotating hub. Lifting strap and chain hoist are being used to rotate hub.

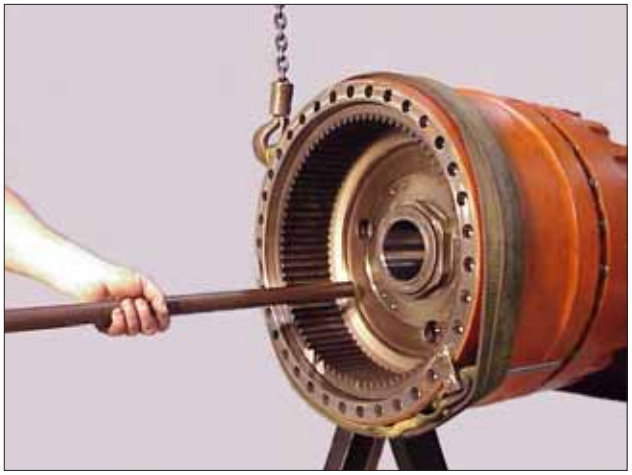


Figure 327
Shock internal hub while rotating wheel hub.

After several revolutions retighten spindle nut to 1200 LBF/FT [1627 Nm].

Repeat steps in figures 326 and 327 as many times as necessary until 1200 LBF/FT [1627 Nm] does not advance nut after shocking.

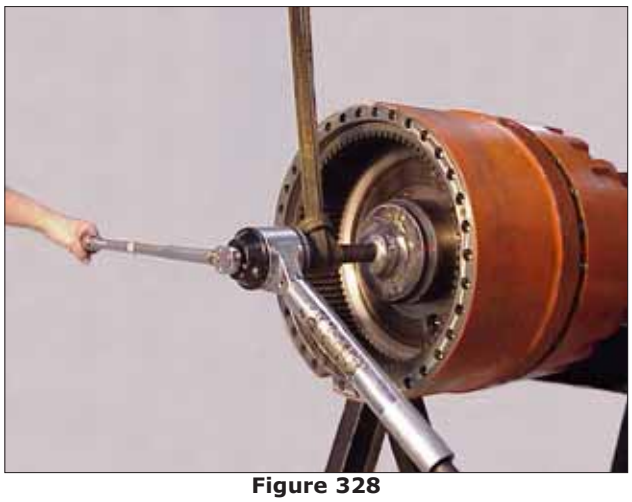


Figure 328
Loosen spindle nut 1/4 to 1/2 turn and shock hub until a slight bearing end play is achieved and the hub rotates freely.

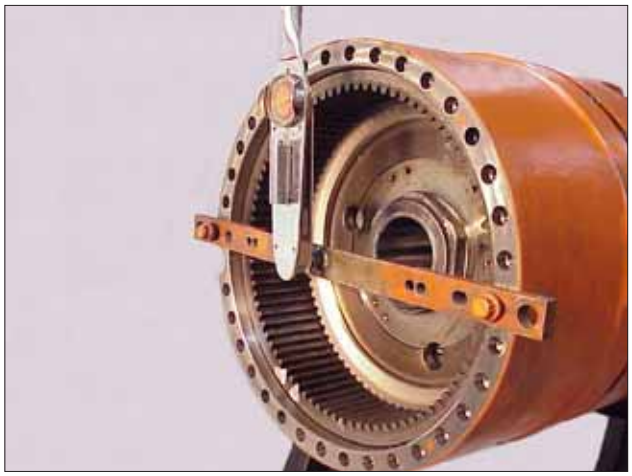


Figure 329
Check no-load rolling torque of hub using a torque wrench and adapter bar or other appropriate measuring device Rolling torque should be between 10-50 LBF/FT [14-68 Nm].

If higher open brake bleeder, rotate hub and shock brake to release brake.

If brake doesn't release apply 3 PSI [21 kPa] to cooling cavity of brake with bleeder open.

Record no-load value.

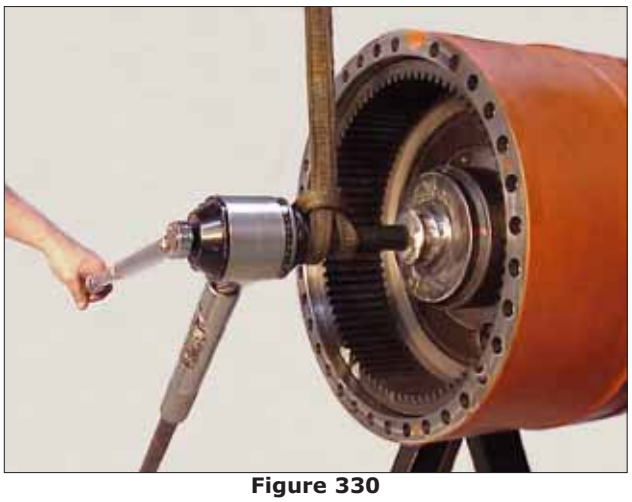


Figure 330
Tighten spindle nut to 600 LBF/FT [813 Nm].

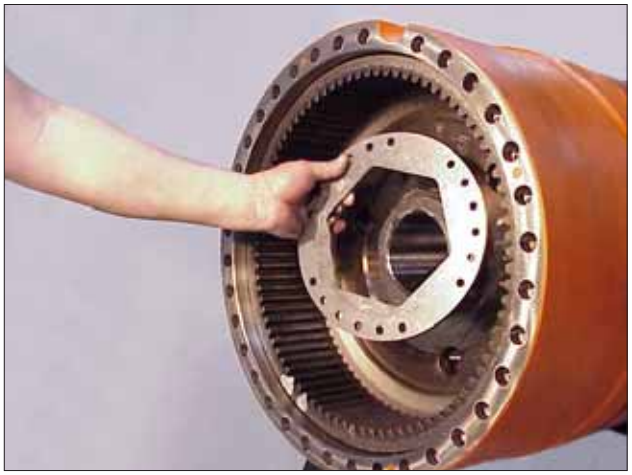


Figure 331
Install spindle nut lock plate.

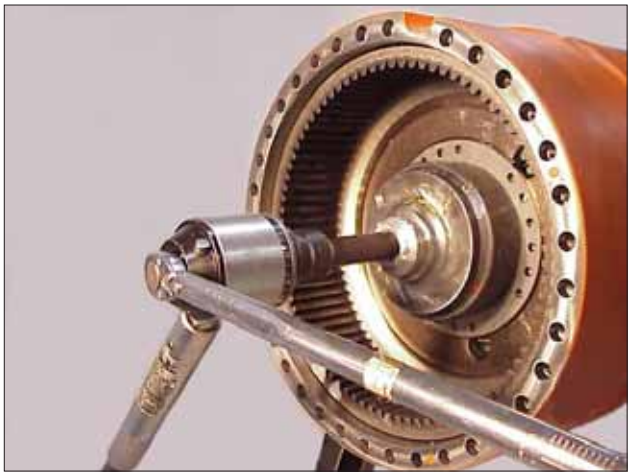


Figure 332
Tighten spindle nut until 1st of (3) pairs of holes in lock plate line up with tapped holes in internal hub.

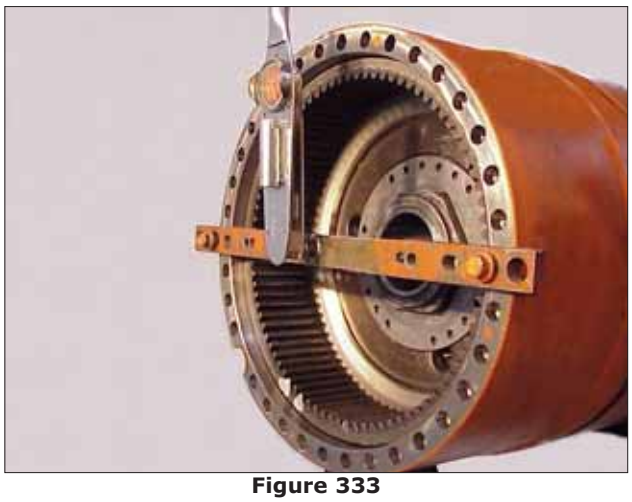


Figure 333

Check rolling torque of hub. This value should be 50-80 LBF/FT [68-108 Nm] over the no-load reading recorded in step on ***figure 329.***

If reading does not fall within specification refer to wheel bearing adjustment procedure items 7 or 8 on page 19.

Brake Cavity and Seal Air Test

Figure 334

Perform brake cavity and seal air test using a gauge, shut off valve and regulator as shown or equivalent.

Apply 12 PSI [83 kPa] to brake through the cooling port and close valve. Brake must hold 12 PSI [83 kPa] for 15 seconds with no drop in pressure.

If leaks occur, determine cause, repair and retest.

Figure 335

Remove air test plumbing and install brake cooling port plugs. Tighten inlet plug to 30-35 LBF/FT [41-47 Nm] and outlet plug to 45-50 LBF/FT [61-68 Nm].

Figure 336

Release hydraulic pressure to brake actuating port and remove hydraulic plumbing. Install brake actuating port plug and tighten to 20-25 LBF/FT [27-34 Nm].

Figure 337

Apply Loctite 262 or equivalent to (6) spindle nut lock plate screws and install.

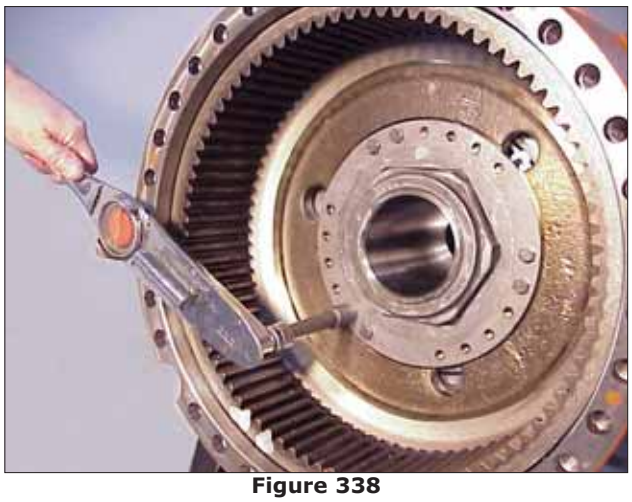


Figure 338
Tighten spindle nut lock plate screws to 25-28 LBF/FT [34-38 Nm].

Differential and Carrier Installation

Figure 339
Apply .09 [2.3 mm] continuous bead of RTV sealant to Differential and carrier mounting surface of axle housing.

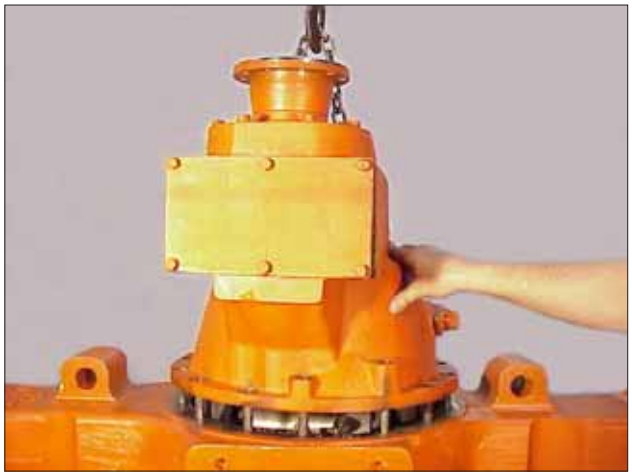


Figure 340
Install differential and carrier assembly.

Figure 341
Install (4) differential mounting tapered dowels.

Figure 342
Install (14) differential mounting stud washers.

Figure 343
Apply Loctite 262 or equivalent to differential mounting stud threads.

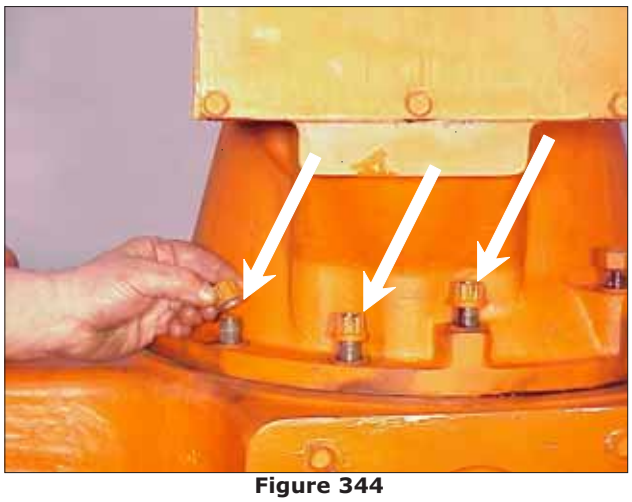


Figure 344
Install (3) twelve point differential mounting stud nuts in locations shown. Install (11) six point nuts on remaining studs.

Figure 347
Apply Loctite 262 or equivalent to (2) carrier cover screws and install with lock washers.

Figure 345
Tighten (14) differential mounting nuts to 175-190 LBF/FT [237-258 Nm].

Figure 348
Tighten (2) carrier cover screws to 65-70 LBF/FT [88-95 Nm].

Figure 346
Remove lifting chain, screws and flat washers.

Figure 349
Apply teflon thread sealer to differential drain plug and install. Tighten to 40-45 LBF/FT [54-61 Nm].

Figure 350
Apply teflon thread sealer to axle drain plug and install. Tighten to 50-55 LBF/FT [68-74 Nm].

Output Bearing & Retainer Installation

Figure 351
Using appropriate driver install inner roller bearing, bearing spacer and outer roller bearing. **NOTE:** Be sure bearings are properly seated against shaft shoulder.

Figure 352
Using appropriate driver install oil seal in bearing and oil seal retainer.
Install bearing and seal retainer o-ring.
NOTES: Dust lip on seal must be positioned with lip facing out. Sealant should not be used.

Figure 353
Insert bearing and seal retainer into axle housing while guiding the outer roller bearing into the retainer bore.
NOTE: Shown without oil seal.

Figure 354
Install (7) lock washers and apply Loctite 262 or equivalent to stud threads.
NOTE: Input and drop gear shaft not as shown.

Figure 355
Install (7) nuts and tighten to 40-45 LBF/FT [54-61 Nm].
NOTE: Input and drop gear shaft not as shown.

Axle Shaft and Sun Gear Installation

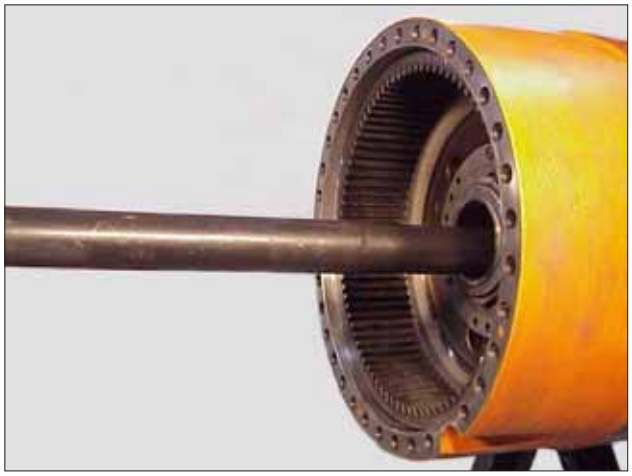


Figure 356
Install axle shaft.

Figure 359
Apply grease and install planetary o-ring.

Figure 357
Install sun gear on axle shaft.

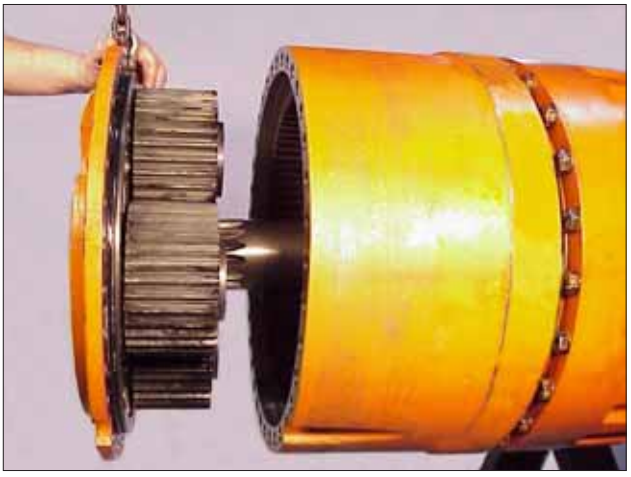


Figure 360
Install planetary assembly.

Planetary Installation

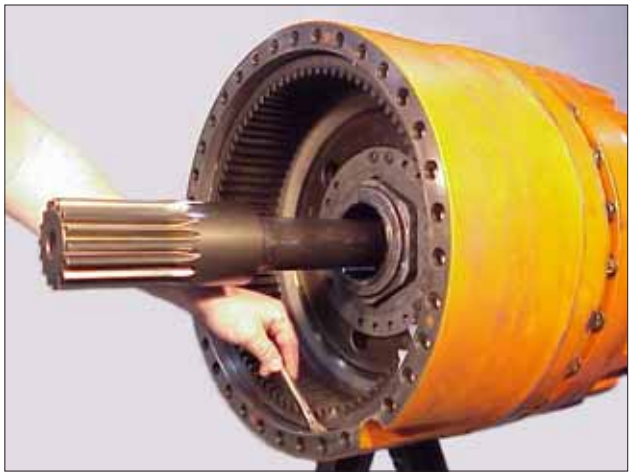


Figure 358
Apply grease to planet sealing ring surface in wheel hub.

Figure 361
Apply Loctite 262 or equivalent to (3) mounting screws.

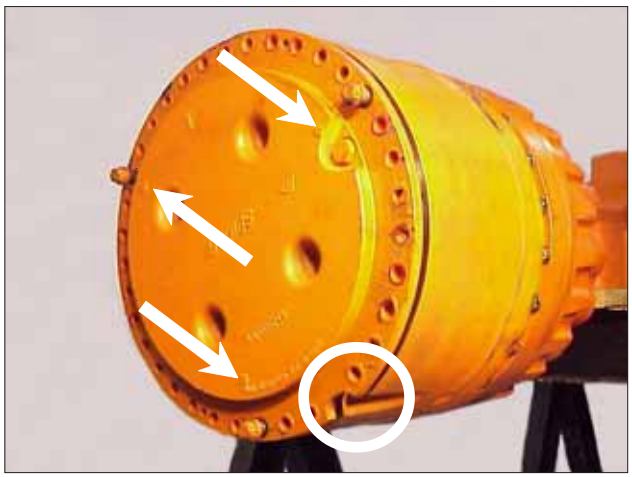


Figure 362
Install (3) planetary mounting screws.
IMPORTANT: Align casting eye brows with each other as shown. The (3) screw locations are identified by small cast buttons on the face of the planet carrier.

Figure 363
Tighten planetary mounting screws to 380-400 LBF/FT [515-542 Nm].

Figure 364
Install planetary oil level and drain plugs and tighten to 30-35 LBF/FT [41-47 Nm].

Output Flange Installation

Figure 365
Pack output shaft oil seal with grease and apply heavy coat to outer lip.
NOTE: Input and drop gear shaft not as shown.

Figure 366
If replacement is required install output flange dust shield using appropriate driver.

Figure 367
Install output flange.
NOTES: The flange splines are an interference fit which require that the flange be heated or driven on shaft. When heat is not used pack dust shield cavity with grease.
Input and drop gear shaft not as shown.

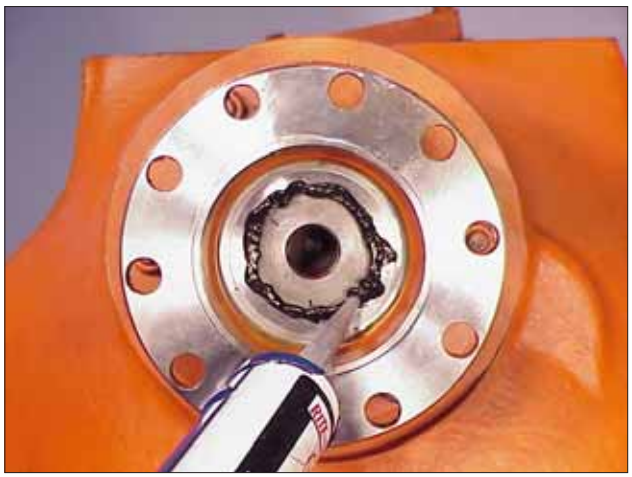


Figure 368
Apply bead of RTV sealant as shown centered over joint between shaft splines and flange splines.
NOTE: Input and drop gear shaft not as shown.

Figure 369
Install flange washer and nut. Tighten output flange nut to 525-560 LBF/FT [712-759Nm].

Figure 370
Install output flange nut cotter pin and bend ends as shown.

Figure 371
Install (2) oil level plugs and tighten to 30-35 LBF/FT [41-47 Nm].

Axle Air Pressure Test

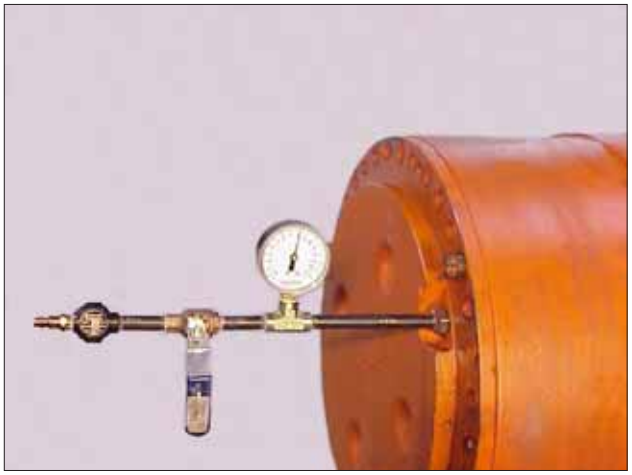


Figure 372
Remove cooling drain plugs from both brakes.

Remove (1) planetary or axle housing plug and install a gauge, shut off valve and regulator or equivalent as shown.

Apply 12 PSI [83 kPa] to pressurize the complete axle assembly and close shut off valve. Axle must hold 12 PSI [83 kPa] for 15 seconds with no drop in pressure. If leaks occur, determine cause, repair and retest.

Remove air test plumbing and reinstall plugs.

Refer to axle pressure test instructions on page 22.

BRAKE SPRING COMPRESSION TOOL INSTRUCTIONS

WARNING: DO NOT ATTEMPT TO MAKE ANY REPAIRS ON THE BRAKE UNTIL THIS TEXT IS COMPLETELY READ AND UNDERSTOOD AND ALL SAFETY PRECAUTIONS COMPLIED TO.

1. Disassemble wheel end from spindle up to and including the removal of the wheel hub from the brake discs. **NOTE:** If axle spindle or axle housing is to be replaced, remove brake as an assembly by removing brake to spindle screws and washers. Remove brake assembly from spindle.

   It is imperative that a special disassembly and reassembly spring compression tool be fabricated before disassembling any part of this brake; a drawing of the tool is included on page 98.

2. Install spring compression tool main section over axle spindle, through brake discs and against the piston pressure ring.

3. Install the bolt plate and bolts over the spindle. Back the bolts out far enough so they do not contact the cylinder face.

4. Install spindle nut and tighten securely against compression tool.

5. Tighten the four (4) compression tool bolts against compression tool cylinder. This will hold the springs in position while removing the brake cover and brake discs.

   WARNING: OUTER BRAKE HOUSING COVER IS UNDER 72,000 LBS. COMPRESSED SPRING PRESSURE AND EXTREME CAUTION

   MUST BE TAKEN IN REMOVING THIS COVER. BRAKE COVER BOLTS MUST BE REMOVED CAUTIOUSLY AND EVENLY. DO NOT REMOVE BRAKE COVER BOLTS ONE (1) AT A TIME.

6. With the spring compression tool securely in place, remove the brake cover bolts evenly. Do not remove bolts one at a time.

7. Remove brake cover and piston from brake housing.

8. Remove the friction and reaction discs.

9. Cautiously and evenly turn out a thread at a time, the compression tool bolts. The compression springs will push the piston pressure ring out of the brake housing.

WARNING: BEFORE REMOVING COMPRESSION TOOL FROM SPINDLE, MAKE SURE ALL SPRING FORCE IS OFF OF PRESSURE RING AND RING MOVES FREELY IN BRAKE HOUSING.

10. Remove spindle nut and remove two piece compression tool.

Refer to pages 37 & 56 for detailed disassembly and reassembly instructions for servicing the internal components of the brake housing and cover.

BRAKE SPRING COMPRESSION TOOL INSTRUCTIONS - CONT.

REASSEMBLY

1. Install brake housing on axle.

2. Install all spring sets.

3. Position piston pressure ring in brake housing.

4. Install spring compression tool main section over axle spindle and centered in pressure ring.

5. Install the bolt plate and bolts over the spindle. Back the bolts out far enough so they do not contact the cylinder face.

6. Install spindle nut and tighten securely against round compression tool.

7. Turn the four (4) compression tool bolts in against compression tool cylinder.

8. Cautiously and evenly in a criss crossing manner, tighten compression tool bolts a thread or two at a time to compress spring sets and push pressure ring into brake housing. Springs are compressed far enough when the tangs on the pressure ring are approximately 1/8 of an inch from being flush with face of brake housing.

9. Install first steel reaction plate in pressure plate.

10. Install first friction disc and lining assembly in pressure ring and against first steel plate.

11. Install second steel reaction ring.

12. Install second friction disc, aligning the four (4) oil grooves in the second disc with the oil grooves in the first friction disc.

13. Alternate steel plates and friction discs until five (5) plates and five (5) discs are installed. First plate installed is steel and last disc installed is friction. **NOTE:** Always align friction disc oil grooves and careful alignment of friction disc teeth at this time will facilitate wheel hub spline alignment in discs at wheel hub assembly in brake.

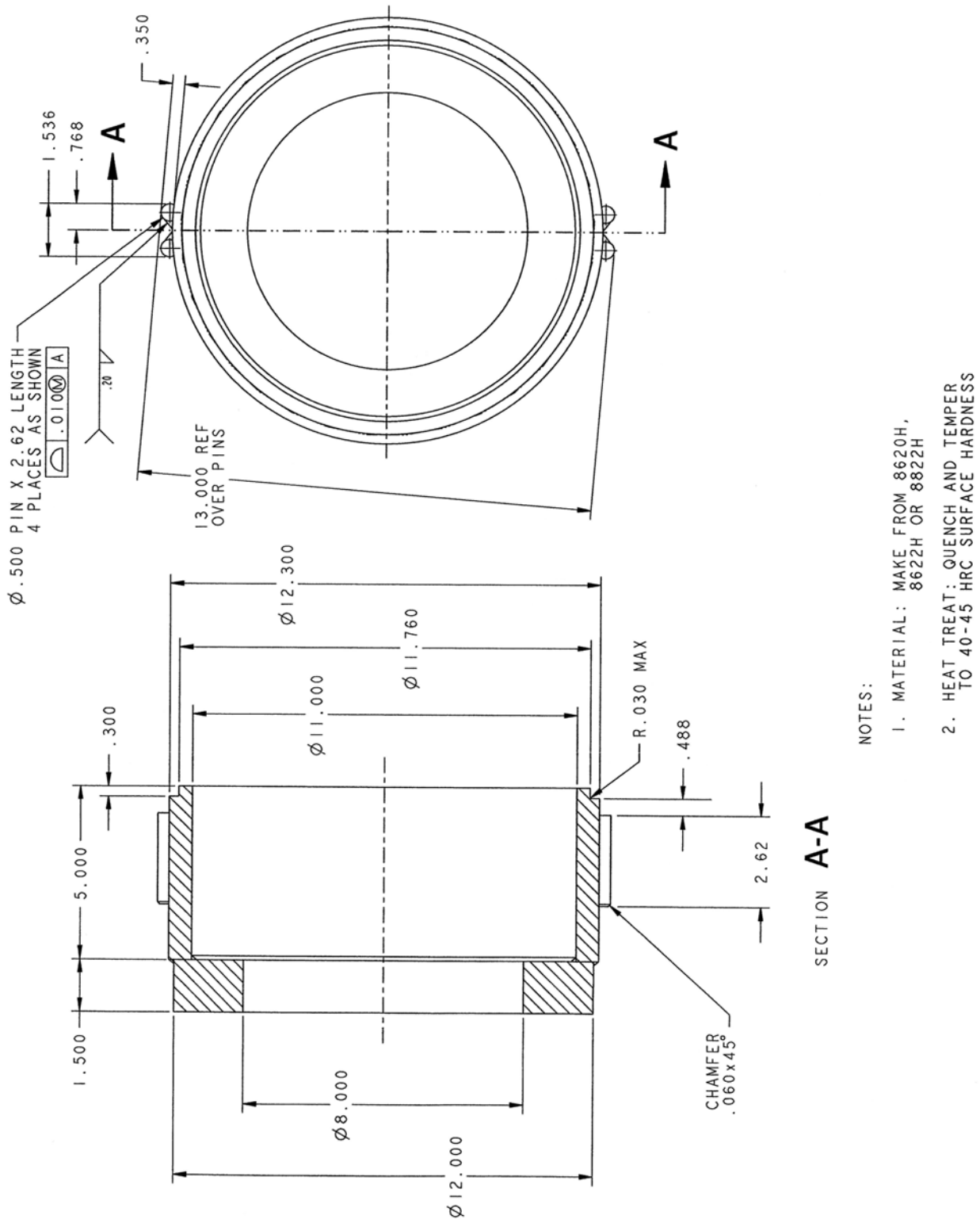
14. Install a new square cut sealing ring in groove in brake housing.

15. Position brake cover on brake housing, aligning fluid hole marks on cover with holes in housing. Refer to Posi-Stop brake reassembly on page 56.

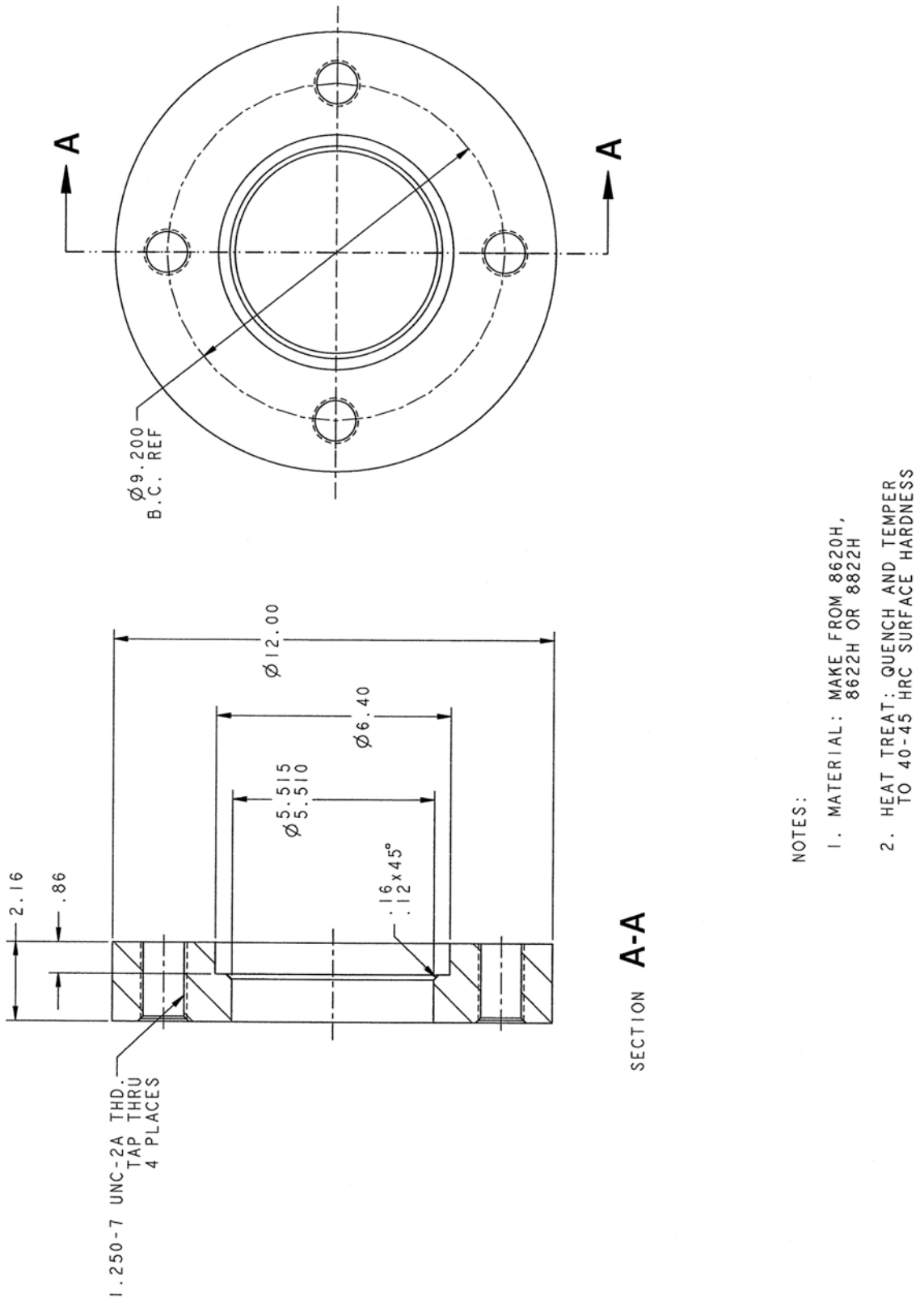
16 Install cover to housing bolts and washers. If there is a slight gap between cover and housing, carefully and evenly tighten bolts to specified torque.

17. Carefully and evenly loosen bolts in compression tool. When bolts are away from compression cylinder, remove spindle nut. Remove compression tool and cylinder from spindle and brake.

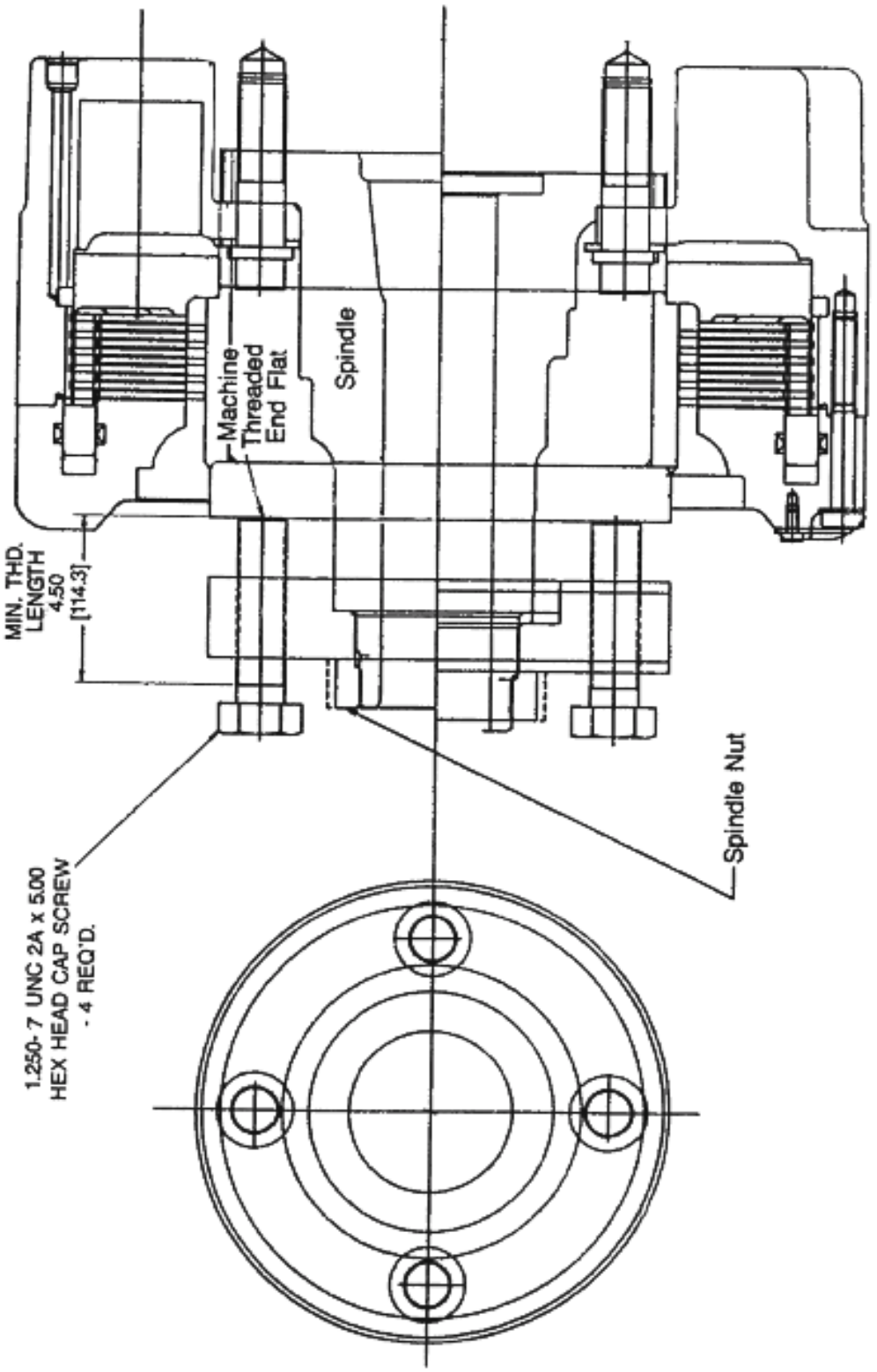
BRAKE SPRING COMPRESSION TOOL WELDMENT



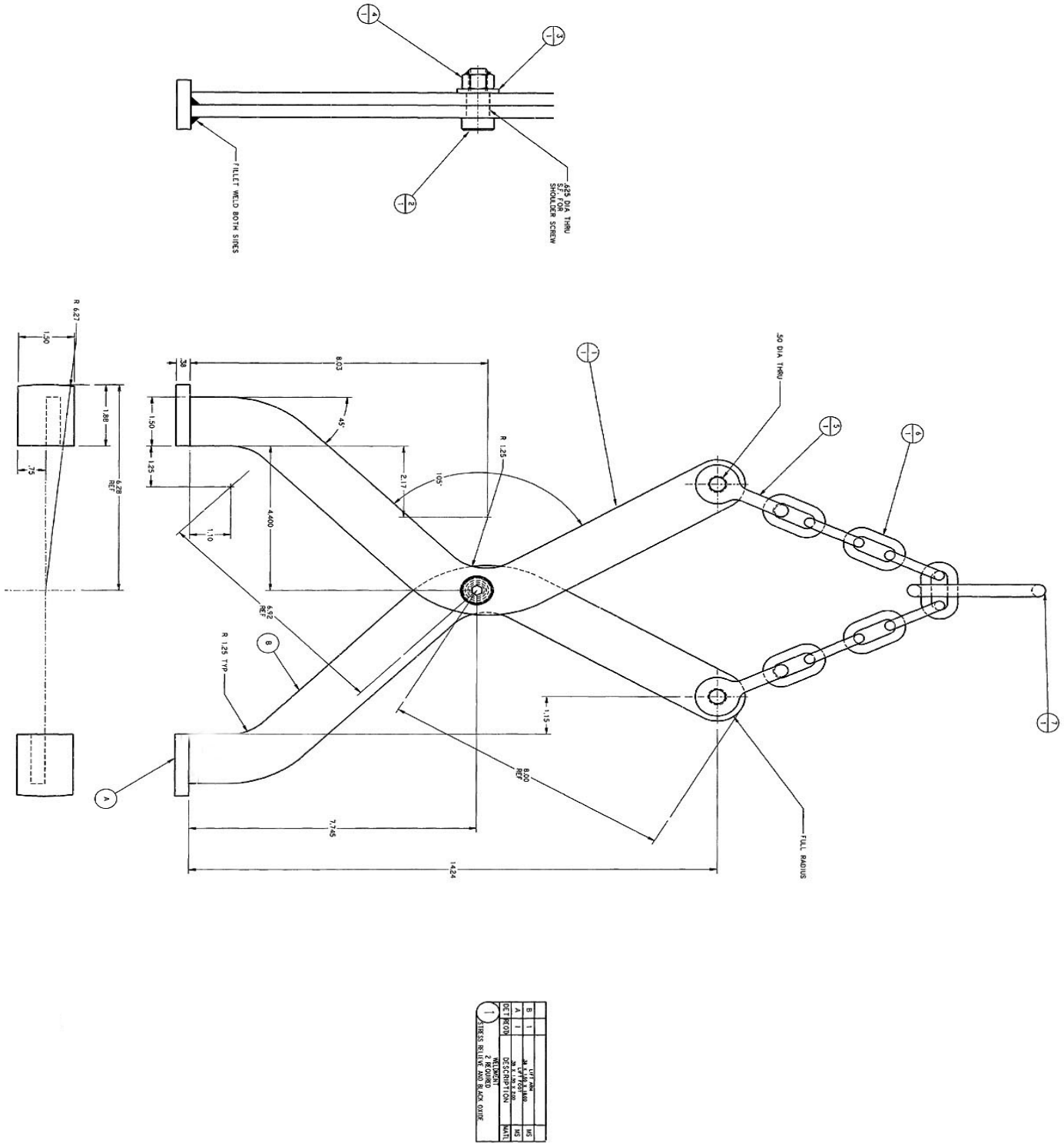
BRAKE SPRING COMPRESSION TOOL BOLT PLATE
Axle Models 53R & 48T



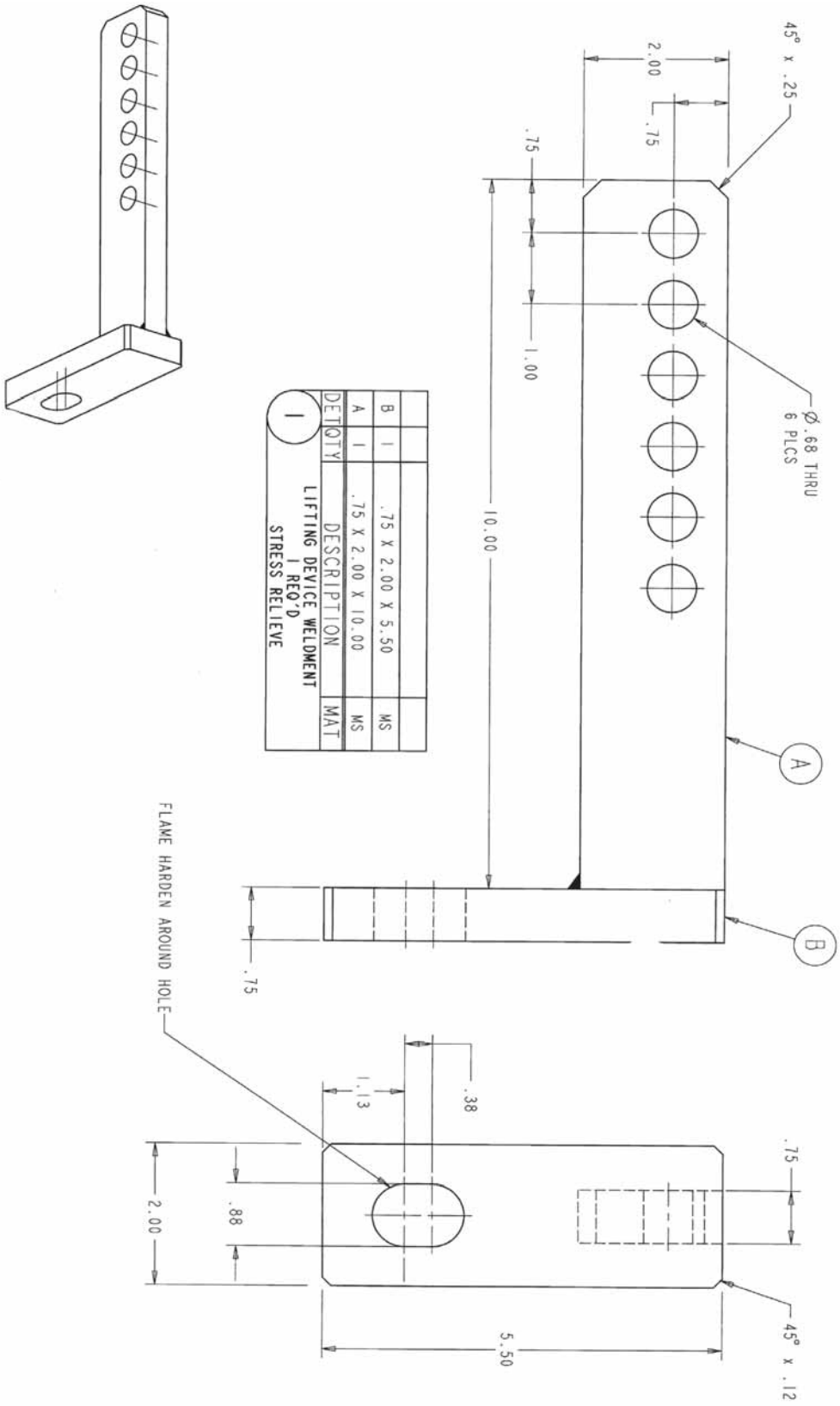
BRAKE SPRING COMPRESSION TOOL INSTALLATION



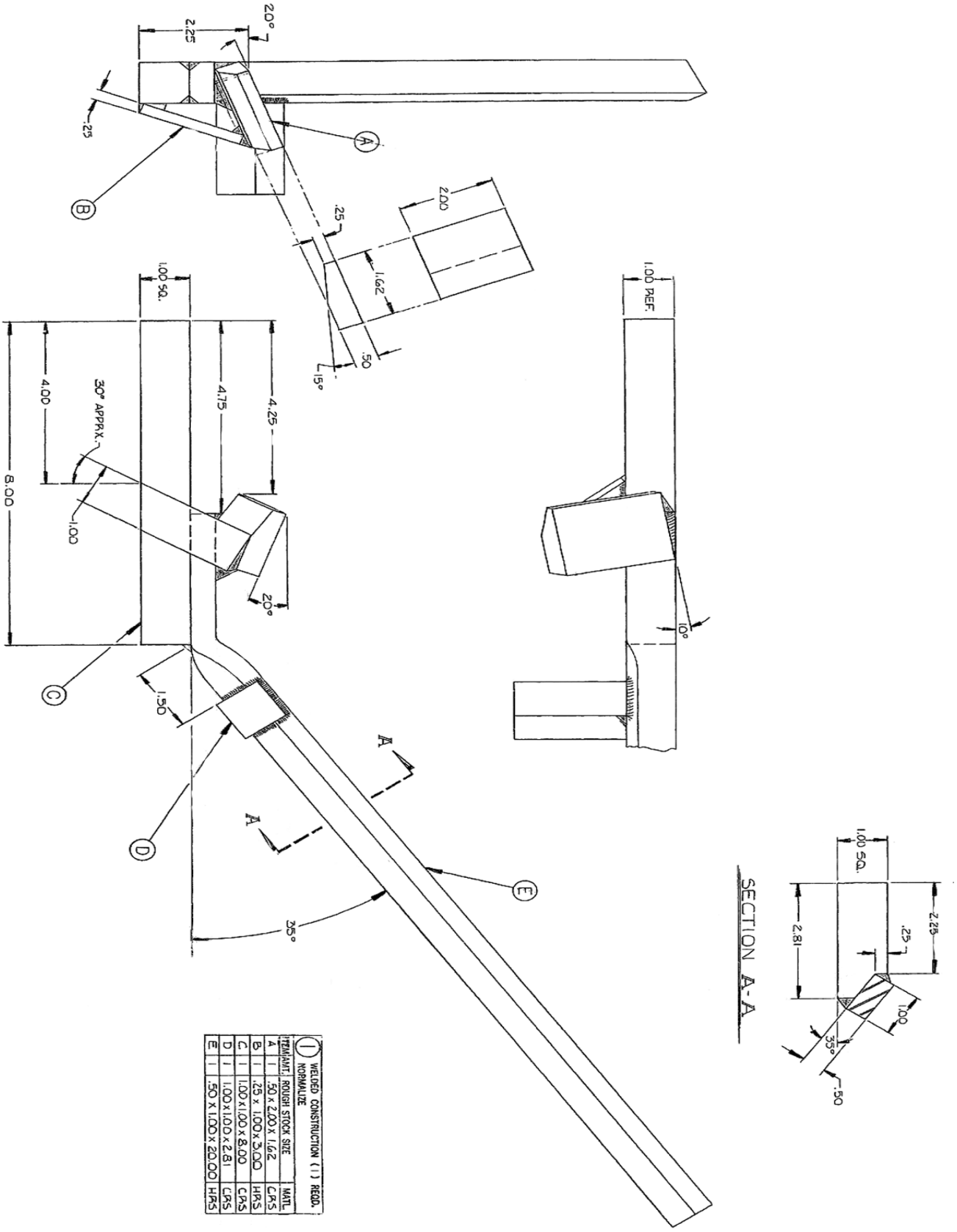
BRAKE PISTON LIFTING TOOL



WHEEL HUB AND BRAKE LIFTING TOOL



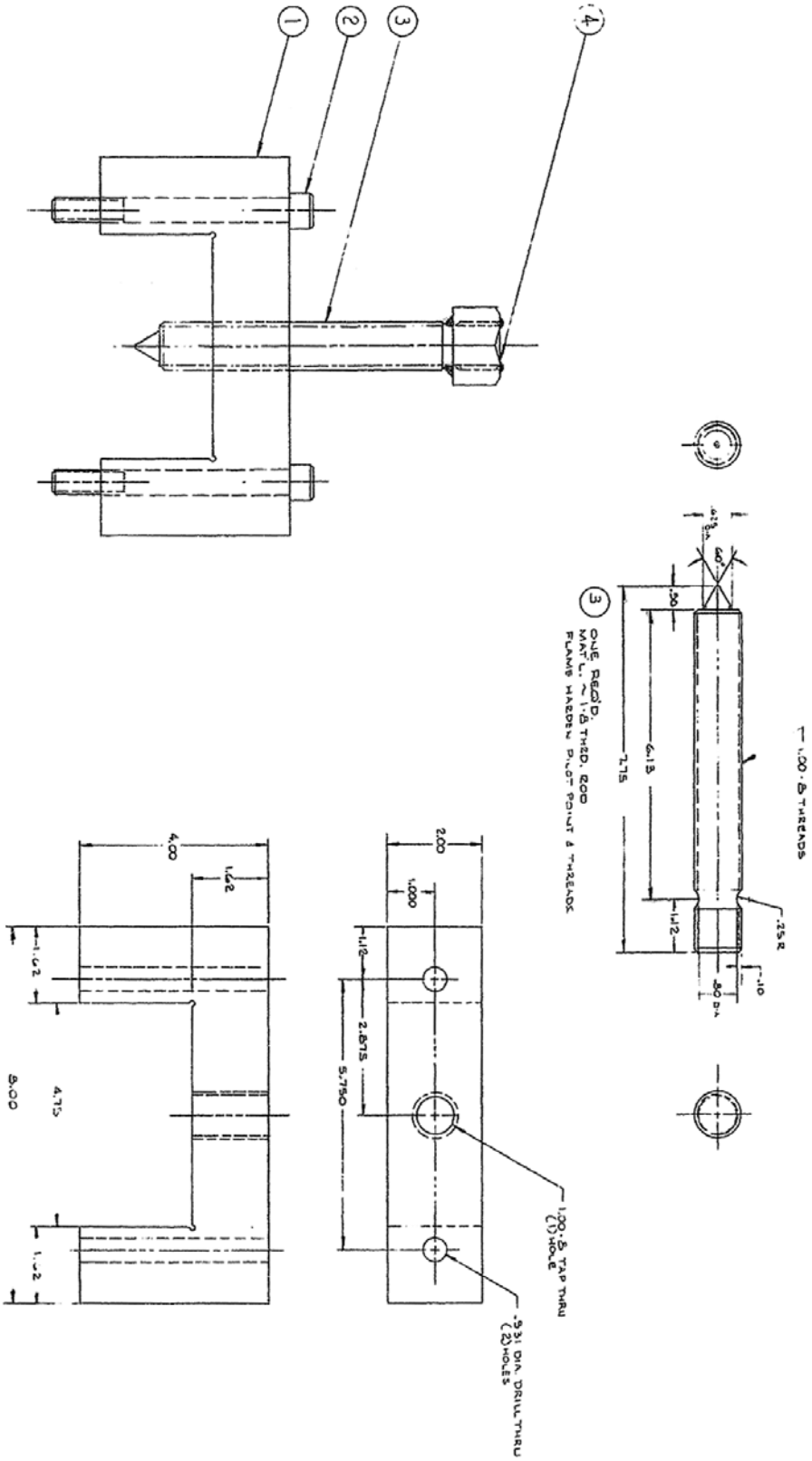
PINION LOCKING TOOL



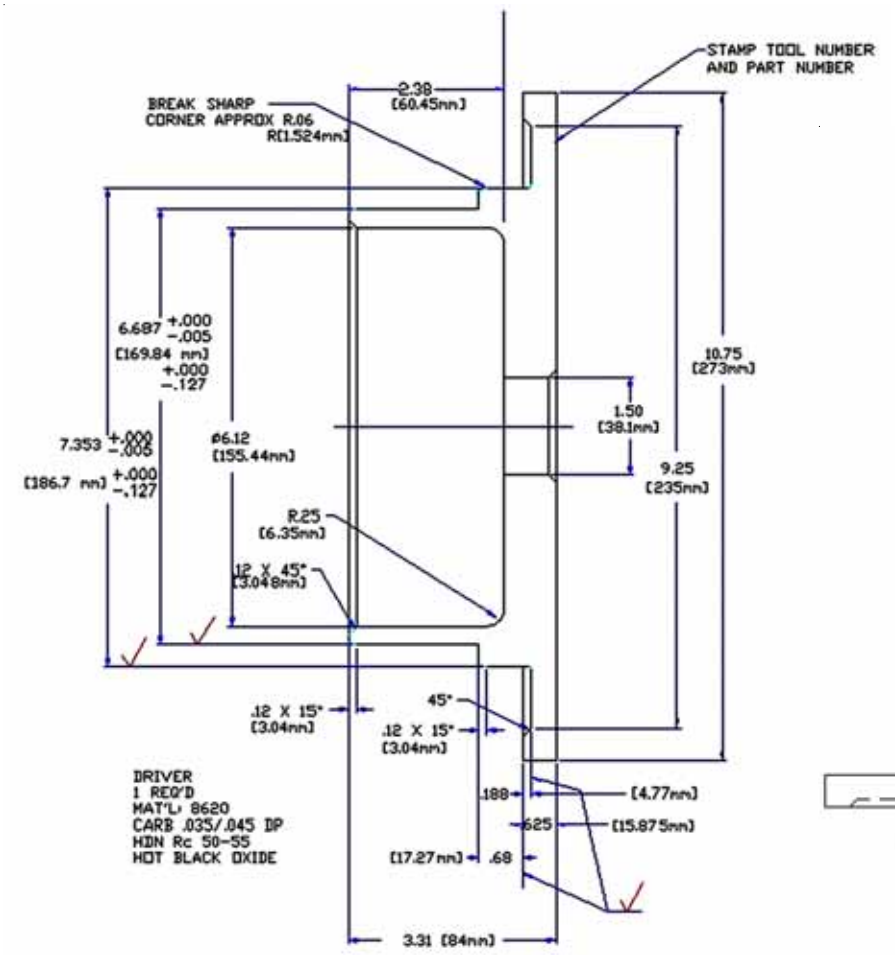
ITEM	QUAN.	ROUGH STOCK SIZE	MATL
A	1	.50 x 2.00 x 1.62	CRS
B	1	.25 x 1.00 x 3.00	HRS
C	1	1.00 x 1.00 x 8.00	CRS
D	1	1.00 x 1.00 x 2.81	CRS
E	1	.50 x 1.00 x 20.00	HRS

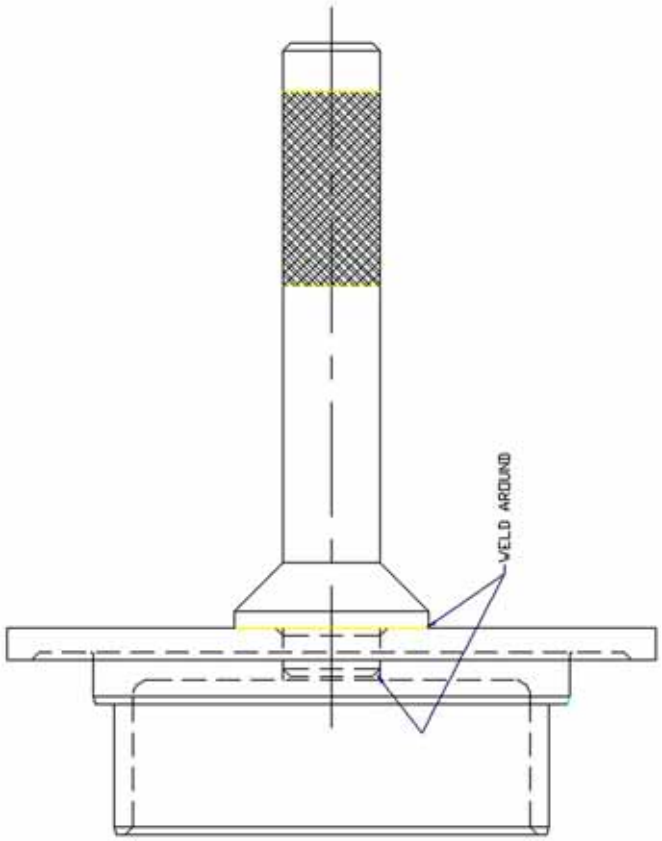
(1) WELDED CONSTRUCTION (1) REQD.
NORMALIZE

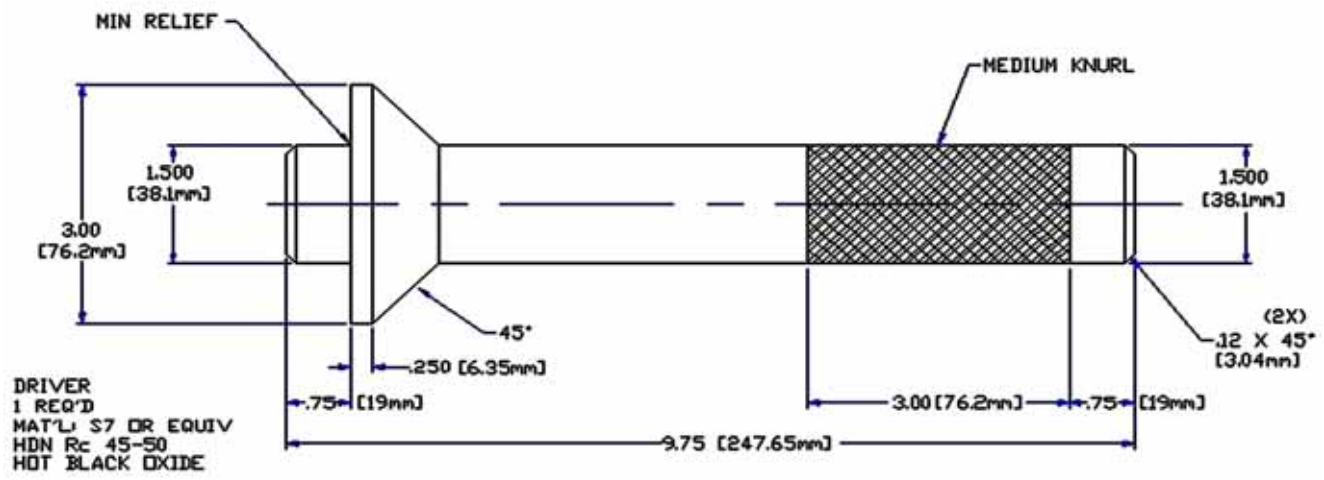
PINION PRESSING TOOL



HUB SEAL DRIVER







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